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SALICYLATE OF BISMUTH.

By Frank H. Rosengarten.

In the "Medical Record" of August 11, 1883, appears an editorial on "The germ theory of typhoid fever, and the treatment of this disease by salicylate of bismuth," giving the results of the experiments of Dr. Desplat in the use of salicylate of bismuth. The "Record" says, "Dr. Desplat is favorably known by his numerous theses on the antiseptic treatment of fevers, especially by a memoir published last year on the treatment of typhoid fever by carbolic acid. After long experimentation with various salicylates in typhoid fever, he has found the salicylate of bismuth the great desideratum, in his experience it has even had a marked abortive action. Thus, out of twenty cases reported by him, eleven (or more than one-half) treated in the first stage were cut short in four or five days under the free use of salicylate of bismuth." The ordinary dose was about a scruple. This was repeated sufficiently often, so that the daily quantity taken should equal about six grammes (or about one drachm and a half).

As this salt is comparatively unknown in this country, and the attention of the medical profession has been so recently called to it, a few words about it will not be out of place. As it is not readily prepared by double decomposition from the other salts of bismuth with salts of salicylic acid, it can only be formed as a sub-salicylate. This salt is a white soft powder, insoluble in water, without separating the salicylic acid on heating to boiling; but is readily soluble in dilute muriatic acid when boiled, the salicylic acid separating, on cooling, in flocculent white crystals. Care must be taken in its preparation to avoid too much heat, as the tendency is to convert the salt into ordinary oxide of bismuth and salicylic acid. Whether it is superior to the salicylates of the cinchona alkaloids is not mentioned, but if its value as a remedy should be owing to its difficult solubility, possibly they may prove as efficient, for the salicylates of quinine and cinchonidine are very difficultly soluble in water, and would hardly be as likely

to prove irritants in case of violent inflammation of the diseased vitals, where, if particles of undecomposed salt of bismuth could aggregate, might produce very dangerous results.

August 25, 1883.

NOTES ON THE EXAMINATION OF QUININE PILLS.

By J. F. Carl Jungk.

For the determination of the percentage of sulphate of quinine in pills, the alkaloidal salt, with the amount of water of crystallization, as officinal in the U. S. Pharmacopœia, 1880, must be taken as a basis. This salt contains

	In 100 parts.	In 10 grains.	
Quinine	74·3119	7·43119 grs.	0·481 gm.
SO_3	9·1743	0·91743 "	0·061 "
H_2O	16·5137	1·65137 "	0·106 "
	99·9999	9·99999 "	0·648 "

or, in other words, ten 1-grain or five 2-grain pills must contain 7·43119 grains, or 0·481 gram of the pure alkaloid.

The method which I formerly used for the examination of such pills has been submitted to Prof. Fresenius, whose opinion is given below, while my present process will be given further on.

First Method.—The pills, either gelatin- or sugar-coated, are rubbed with water to a smooth paste; this is mixed with recently slaked lime and the mixture evaporated to dryness over a water-bath. The dry product is then rubbed into a very fine powder and treated with chloroform until a drop of the filtered liquid evaporated on a watchglass will not leave any residue, and also not give any opacity with a solution of iodide of mercury and potassium after the addition of a few drops of diluted acid.

The chloroform solution is then evaporated in an accurately tared vessel, at a low heat, until the weight of the residue remains constant. The weight of this product represents the weight of quinine, that is, if on application of tests the residue proves to be pure quinine.

The amount of water of crystallization was first determined in the crystallized sulphate of quinine to be used in making the analysis. The salt was then formed into pills with gum, sugar and starch.

Sulphate of quinine employed.	Found.	Loss.
0·1320	0·1297	0·0023
0·1123	0·1112	1·0011
0·1622	0·1602	0·0020
0·4065	0·4011	0·0054

There was a loss of 1·328 part for each 100 parts of the salt employed, which gives for each 10 grains of quinine sulphate used a loss of 0·1328 grains; or, instead of 7·4312 grains, only 7·2984 grains of pure quinine were obtained.

In a letter dated Wiesbaden, March 10, 1882, Professor Dr. R. Fresenius speaks of this method as follows:

(Translation.) "In order to form a definite opinion on your method for the determination of sulphate of quinine, I have made several experiments. I have first employed pure sulphate of quinine, and obtained by your method the following figures:

Sulphate of quinine used.	Found.
1. 0·1250 gm.	0·1254 gm.
2. 0·1440 "	0·1443 "

"For determining the influence of sugar and gum, the sulphate of quinine was mixed with equal weights of the bodies named, when the results, according to your method, were as follows:

Sulphate of quinine used.	Found.
1. 0·1282	0·1260
2. 0·1348	0·1335
3. 0·1268	0·1248

"I will not omit to direct attention to the necessity, in the presence of a considerable proportion of gum, of very carefully triturating the mass which has been dried with the lime, and of extracting it very frequently with chloroform. In other respects I can only confirm that the method adopted by you will yield quite useful results."

Second Method.—The loss by the above method was considered to be too great, and for this reason the following procedure was adopted: The pills are rubbed into a smooth paste with a little water, 2 drops of diluted sulphuric acid being added for each grain of quinine sulphate. A quantity of recently slaked lime equal to three times the weight of the pills is well mixed with the paste; then the same weight of well-washed and dried fine sand is added; the whole is thoroughly triturated and dried at a moderate heat, when it can be easily powdered and readily removed from the mortar without loss. The fine powder thus obtained is placed in a small glass percolator, which is fixed to an accurately tared flask by means of a twice perforated cork. The percolator is connected with a back-flow cooler, or reversed condenser, such as is used in plant analysis, and which has often been

described. For every 20 grains of sulphate of quinine 2 or 3 fluidounces of chloroform are now poured on the powder, or into the flask. The apparatus is then put together, and the flask heated by means of a sand-bath to 70°–80°C.

If the destillation and condensation of the chloroform proceeds regularly, the whole quantity of the quinine will be extracted in about one hour. The apparatus is allowed to cool, a small quantity of chloroform is poured into the percolator, and a drop on coming through evaporated on a watch crystal. If a residue remains, it is dissolved in a little chloroform, and put back on the powder, and ½ to 1 fluidounce of chloroform more added. If no residue remains on the crystal, and the drop causes no opacity with diluted acid and a solution of iodide of mercury and potassium, the heating is continued for 10 or 15 minutes longer, so as to be certain that all the quinine has been extracted. Now allow the apparatus to cool, evaporate the chloroform in the tared flask, and dry the residue by means of an air-bath and a moderate heat until the weight remains constant. The residue will represent the amount of quinine, if it answers to the test of pure quinine. If the pills represented 20 grains of quinine sulphate, the residue should weigh 14·86238 grains, or 0·961 gram.

Experimental Analyses.—The sulphate of quinine was mixed with sufficient starch, gum and sugar to make 30 parts represent 10 parts of sulphate of quinine; the results by the second method were:

	Sulphate of quinine used.	Found.	Loss.
1.	·1545	·1544	·0001
2.	·1036	·1036	.....
3.	·1328	·1327	·0001
4.	·1063	·1062	·0001
	·4972	·4969	·0003

The loss expressed in per cent. was only 0·0603, or for each 10 grains there was a loss of 0·00603 grain.

For the further examination of the alkaloid obtained in this manner I use the polariscope, and proceed according to the method suggested by Mathias Rozsnyay, of Arad, Hungary, for these optical observations. The polariscope used by me was made by Drs. Sterg and Reuter, of Homburg, and is correct to $\frac{1}{10}$ per cent. The alkaloid is obtained by the second method from pills representing 20 grains of sulphate of quinine. 0·7432 gram of this alkaloid is dissolved

in sufficient distilled water, acidulated with 5 drops of concentrated sulphuric acid, so as to make the solution measure 20 cc. exactly. A tube 200 mm. long is filled with this solution, placed in the apparatus, and polarized. The percentage of pure quinine is determined from the following table.

Explanation and Table for the quantitative and qualitative analysis of cinchona alkaloids by means of the polariscope and a 200 mm. polarizing tube, from the observations by Mathias Rozsuyay.

The following solutions were prepared:

1, Quinine sulphate; 2, conchinine (quinidine) sulphate; 3, cinchonidine sulphate; 4, cinchonine sulphate, of each 1 gram was dissolved in 20 cc. water and 3 drops conc. sulphuric acid.

Each salt, chemically pure, was made by Jul. Jobst, of Stuttgart. These solutions deviate the polarizing plane as follows:

1, Quinine solution, left — 22°; 2, conchinine solution, right + 31°; 3, cinchonidine solution, left — 14°; 4, cinchonine solution, right + 25°.

A solution of the sulphate of a cinchona alkaloid of the above proportion, which does not correspond with the divergence indicated is not chemically pure.

As commercial quinine sulphate usually contains conchinine, and commercial conchinine sulphate contains cinchonidine, the first-named salt should be examined for conchinine, and the sulphate of this alkaloid for cinchonidine, which is readily and precisely accomplished by use of the polariscope, while other impurities are easily detected by well known reagents.

If, for instance, the polarizing plane of a normal solution of quinine sulphate diverges only 21° instead of 22° towards the left, the salt is then contaminated with 2 per cent. of conchinine sulphate,

as	0·98 × 22 = left,	21·56°
and	0·02 × 31 = right,	·62°
	Difference = left,	20·94°

A quinine sulphate solution which contains 5 per cent. of conchinine sulphate shows still greater difference:

0·95 × 22 = left,	20·90°
0·05 × 31 = right,	1·55°
Difference = left,	19·35°

A conchinine sulphate, the polarizing plane of which diverges only 30° instead of 31°, contains about 2 per cent. of cinchonidine sulphate, as

$$0{\cdot}98 \times 31 = \text{right}, \quad 30{\cdot}38°$$
$$0{\cdot}02 \times 14 = \text{left}, \quad 0{\cdot}28°$$
$$\text{Difference} = \text{right}, \quad 30{\cdot}10°$$

A cinchonine sulphate solution which is contaminated with 5 per cent. of cinchonidine sulphate is very easily recognized as

$$0{\cdot}95 \times 31 = \text{right}, \quad 29{\cdot}45°$$
$$0{\cdot}05 + 14 = \text{left}, \quad 0{\cdot}70°$$
$$\text{Difference} = \text{right}, \quad 28{\cdot}75°$$

An exhaustive treatise on these optical observations, by Rozsnyay, may be obtained from Drs. Sterg and Reuter, in Homburg, for the small sum of 1 mark

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UNGUENTUM HYDRARGYRI NITRATIS.

By Charles Wolf Reichard, Ph.G.

From an Inaugural Essay.

The author made a series of experiments, following the process of the Pharmacopœia for 1880, but using different kinds of fats. 76 parts of the fat were heated to 70°C., when 7 parts of nitric acid, of the proper strength, were added without stirring, but with continuing the heat as long as a moderate effervescence took place; when nearly cool, the warm solution of 7 parts of mercury in 10 parts of nitric acid was added and stirred. In each case the degree or absence of effervescence, change of color and other changes were noted, as was also the color, odor and consistence of the preparation as soon as it had become cold, about an hour after the mercury solution had been added to the fat. Similar observations were afterwards made at regular intervals. The fats used were (1) castor oil, (2) neats' foot oil, (3) linseed oil, (4) vaseline, (5) cosmoline, (6) oleic acid, (7) sweet almond oil, (8) lard oil, (9) cotton seed oil, (10) lard, (11) lard and lard oil, (12) lard and cotton seed oil, (13) lard oil and sweet almond oil, (14) castor oil and sweet almond oil, and (15) butter. The author has tabulated his results as follows:

No. of prepar.	Freshly prepared.			After two weeks.			After two months.		
	Color.	Odor.	Consistence.	Color.	Odor.	Consistence.	Color.	Odor.	Consistence.
1.	Pale yellow	Strongly rancid	Stringy	Yellow-green	Less rank	Waxy	Pale green	Very slightly rank.	Waxy
2.	Slightly brown yellow	Slight	Syrupy	Pale yolk-yellow	Less strong	Good	Light yellow	Slight	Slightly firmer
3.	Brown, dark red	None	Liquid	Same	Same	Same	Same	Same	Same
4.	Light brown	None	Granular and spongy	Same	Same	Same	Same	Same	Same
5.	Light brown	None	Granular and spongy	Same	Same	Same	Same	Same	Same
6.	Red-yellow	None	Liquid	Red-yellow	Same	Spongy, semi-liquid	Same	None	Good
7.	Light yolk-yellow	None	Butter-like, smooth	Lighter	Same	Firmer	Very light	None	Very firm
8.	Yellow	Slight	Good	Bright yellow	Slight	Good	Same	None	Good
9.	Red yellow	Lard-like	Soft	Red-yellow	Lard-like	Soft and sticky	Very dark	Slight	Soft and sticky
10.	Light	None	Good	Lighter	None	Hard	Same	None	Too hard
11.	Light yellow	Slight	Good	Not changed	None	Firm	Not changed	None	Too hard
12.	Light brown	None	Hard	Light brown	None	Hard	Unchanged	None	Hard
13.	Light yellow	Slight	Good	Unchanged	Rank and disagreeable	Good	Unchanged	Rank and disagreeable	Good
14.	Light yellow	Slight	Good	Unchanged	Rank and disagreeable	Good	Unchanged	Rank and disagreeable	Good
15.	Light yellow	Slight	Good	Unchanged	Changing	Good	Unchanged	Rank and disagreeable	Soft

It is the author's opinion that the present base for citrine ointment, lard oil, though not being perfect in all respects, has the fewest objectionable features, and that its adoption is a decided step toward perfection.

COMPARISON OF GALENICAL PREPARATIONS OF THE UNITED STATES AND GERMAN PHARMACOPŒIAS.

By the Editor.

(Continued from page 401.)

Ferri Carbonas saccharatus, U. S. Ferrum carbonicum saccharatum, *P. G.*—The first part of the process directing the decomposition of the ferrous sulphate is identical in relative proportions and manipulation except that the German Pharmacopœia directs the solution of ferrous sulphate to be filtered directly into the clear solution of sodium bicarbonate, contained in a capacious bottle. The ferrous carbonate from 10 parts of the sulphate is mixed with 16 parts of sugar, *U. S.*, with 2 parts of milk sugar and 6 parts of sugar, dried and sufficient sugar added to make 20 parts, *P. G.* The result is in both cases practically alike. The powder contains not less than 15 per cent. of ferrous carbonate, *U.S.*; it contains 10 per cent. of iron, *P. G.*

Ferri Oxidum hydratum cum Magnesia, U. S. Antidotum Arsenici, *P. G.*—Solution of ferric sulphate sp. gr. 1·320, 65 gm., water 130 gm., magnesia 10 gm., water 1,000 gm. *U. S.*—Solution of ferric sulphate sp. gr. 1·429, 100 parts, water 250 parts; magnesia 15 parts, water 250 parts. *P. G.*—When mixed, the first preparation is considerably more diluted and contains a somewhat larger amount of free magnesia than the second preparation.

Glyceritum Amyli, U. S Unguentum Glycerini, *P. G.*—Starch 10 parts, glycerin 90 parts; heat to 140°C. until a translucent jelly is formed. *U. S.*—Rub powdered tragacanth 1 part with alcohol 5 parts, then with glycerin 50 parts and heat by means of a steam-bath until a uniform translucent mass is formed. *P. G.*

Infusa, U. S., P. G.—Substance 1 part, boiling water 10 parts; let stand two hours and strain. *U. S.*—Substance 1 part, hot distilled water 10 parts; keep for five minutes in a vapor-bath of boiling water, let cool and strain. *P. G.*

Infusum Sennæ compositum, U. S., P. G.—Senna 6 parts, manna 12 parts, magnesium sulphate 12 parts, fennel 2 parts, boiling water 100 parts; when cool strain; the product weighs 100 parts. *U. S.*—Senna

5 parts, hot distilled water 30 parts; keep for 5 minutes in a hot water-bath, let cool, strain, add Rochelle salt 5 parts and manna 10 parts, and strain; the product weighs 40 parts. *P. G.*

Linimentum Ammoniæ, U. S., Linimentum ammoniatum, *P. G.*—Ammonia water 30 parts, cotton seed oil 70 parts. *U. S.*—Olive oil 3 parts, poppy seed oil 1 part, ammonia water 1 part. *P. G.*

Linimentum Saponis, U. S. Linimentum saponato-camphoratum liquidum. *P. G.*—Dissolve soap 7 parts in water 14 parts, and add to solution of camphor 5 parts and oil of rosemary 1 part in alcohol 70 parts; add water to make 100 parts. *U. S.*—Spirit of camphor ($\frac{1}{10}$) 120 parts, soap spirit 350 parts, ammonia water 24 parts, oil of thyme 2 parts; oil of rosemary 4 parts; mix. *P. G.* (For linimentum saponato-camphoratum *P. G.*, see page 81). The soap spirit is prepared as follows:

Spiritus saponatus, P. G.—Boil in a water-bath olive oil 60 parts, potassa solution sp. gr. 1·114, 70 parts and alcohol 75 parts, until saponification has been effected, add alcohol to restore original weight, also alcohol 225 parts and water 170 parts.

Linimentum Terebinthinæ, U. S. Linimentum terebinthinatum, *P. G.*—Resin cerate 65 parts, oil of turpentine 35 parts; mix. *U. S.*—Mix intimately crude potassium carbonate 6 parts with commercial soft soap 54 parts and add oil of turpentine 40 parts. *P. G.*

Liquor Ammonii Acetatis, U. S. Liquor ammonii acetici, *P. G.*—Neutralize diluted acetic acid sp. gr. 1·0083, with ammonium carbonate. *U. S.*—Mix ammonia water 10 parts with acetic acid sp. gr. 1·041, 12 parts, boil for a short time, cool, neutralize exactly with ammonia and add distilled water, to make the spec. grav. 1·032–1·034. *P. G.* The object of the boiling is evidently the expulsion of foreign odorous compounds, probably also of carbonic acid.

Liquor Calcis, U. S. Aqua Calcariæ, *P. G.*—Slake lime 1 part with water 6 parts (4 p. *P. G.*), and mix with water 30 parts (50 p. *P. G.*); allow to settle and decant; add to residue 300 parts (50 parts *P. G.*) of distilled water. *U. S.* Both formulas yield saturated solutions of lime in water.

Liquor Ferri Acetatis, U. S. Liquor Ferri acetici, *P. G.*—Dilute solution of ferric sulphate sp. gr. 1·320, 100 parts with water 350 parts and add to ammonia water 80 parts diluted with water 200 parts; wash the precipitate, drain and press until 70 parts remain; dissolve this in glacial acetic acid sp. gr, 1·057, 26 parts and add distilled water to

make 100 parts. The specific gravity is 1·160. *U. S.*—Dilute solution of ferric chloride sp. gr. 1·281, 10 parts with water 50 parts and add to ammonia water 10 parts, diluted with water 200 parts; wash the precipitate, express strongly, dissolve in acetic acid sp. gr. 1·041, 8 parts, and add sufficient distilled water to make the sp. gr. 1·081–1·083. *P. G.* In making these preparations heat must be avoided.

Liquor Ferri Chloridi, U. S. Liquor Ferri sesquichlorati, *P. G.*—Treat iron 15 parts with hydrochloric acid 54 parts and water 25 parts; when saturated filter, add to the filtrate hydrochloric acid 27 parts and oxidize with nitric acid 8 parts or a sufficient quantity; cool and add hydrochloric acid 5 parts and sufficient water to make 100 parts. Spec. grav. 1·405. *U. S.*—Treat iron with 4 times its weight of hydrochloric acid, and wash, dry and weigh the undissolved iron. For every 100 parts of iron dissolved, add hydrochloric acid 260 parts and nitric acid 112 parts, oxidize completely, evaporate to 483 parts, and while warm dilute with distilled water to 1,000 parts. Spec. gravity 1·280–1·282. *P. G.* The solution contains 18·6 per cent. of ferric oxide, *U. S.*, 10 per cent. of iron = 14·28 per cent. of ferric oxide, *P. G.*

Liquor Ferri Tersulphatis, U. S. Liquor Ferri sulfurici oxydati, *P. G.*—Except in manipulation and final strength the two formulas are identical. Ferrous sulphate 80 parts are oxidized with nitric acid sp. gr. 1·42, 11 parts *U. S.*, or sp. gr. 1·185, 18 parts *P. G.*, or a sufficient quantity, and yield 200 parts, *U, S.*, 160 parts *P. G.*, of solution of the specific gravity 1·320 *U. S.*, 1·430 *P. G.*

Liquor Plumbi Subacetatis, U. S. Liquor Plumbi subacetici, *P. G.*—Boil for 30 minutes lead acetate 170 parts, lead oxide 120 parts, and distilled water 800 parts; cool, add water to make 1,000 parts and filter. Specific gravity 1·228 *U. S.*—Melt with the heat of a water-bath lead acetate 6 parts, levigated litharge free from carbonate, 2 parts and distilled water 1 part; when the mass has become white or reddish white add distilled water 19 parts; let subside and filter. Specific gravity 1·235–1·240 *P. G.*

Liquor Plumbi Subactatis dilutus, U. S. Aqua Plumbi, *P. G.*—Mix solution of lead subacetate 3 parts with distilled water 97 parts, *U. S.*, 147 parts *P. G.*

Liquor Potassæ, U. S. Liquor Kali caustici, *P. G.*—Directions for preparing this solution are given only by the U. S. Pharmacopœia.

The solution has the density 1·036 *U. S.*, 1·142–1·146 *P. G.*, and contains 5 per cent., *U. S.*, 15 per cent., *P. G.*, of potassium hydroxide.

Liquor Potassii Arsenitis, U. S. Liquor Kalii arsenicosi, *P. G.*—The two preparations are identical in strength, 100 parts containing 1 part of arsenious acid and are flavored with compound tincture of lavender 3 parts, *U. S.*, with compound spirit of melissa 15 parts, *P G.*

Liquor Sodæ, U. S. Liquor Natri caustici, *P. G.*—The last-mentioned authority gives no formula for preparing this solution, which has the density of 1·059 *U. S.*, 1·159–1·163, *P. G.*, and contains 5 per cent. *U. S.*, 15 per cent. *P. G.*, of sodium hydroxide.

Liquor Sodii Silicatis, U. S. Liquor Natrii silicici, *P. G.*—No formula; both liquids identical.

Magnesii Citras granulatus, U. S. Magnesium citricum effervescens, *P. G.*—Mix magnesium carbonate 11 parts, citric acid 33 parts and water sufficient; dry at 30°C., powder and mix intimately with sugar 8 parts, sodium bicarbonate 37 parts and citric acid 17 parts; dampen the fine powder with alcohol and convert it into a coarse granular powder. *U. S.*—Magnesium carbonate 25 parts, citric acid 75 parts, and water 10 parts; sodium carbonate 85 parts, citric acid 40 parts, sugar 20 parts; the manipulations are identical and the proportions of the ingredients very nearly so, with those of the preceding formula. *P. G.*

Massa Ferri Carbonatis, U. S. Pilulæ Ferri carbonici, *P. G.*—Dissolve ferrous sulphate 100 parts in boiling water 200 parts and add syrup 25 parts; when cold mix with a solution of sodium carbonate 110 in water 200 parts; wash the precipitate with a mixture of syrup 1 part and water 16 parts, drain, express, mix with honey 38 parts and sugar 25 parts, and evaporate the mixture to 100 parts. *U. S.*—Ferrous carbonate is formed in precisely the same manner as directed for Ferrum carbonicum saccharatum (see page 440), no sugar being used, the proportions being ferrous sulphate 50 parts and boiling water 200 parts, which solution is filtered into a solution of sodium bicarbonate in tepid water 500 parts; the washed precipitate is mixed with sugar 8 parts, and honey 26 parts and the mixture is evaporated to 40 parts; 20 gm. of this mass with sufficient powdered marshmallow root are formed into 200 pills, which are rolled in powdered cinnamon; each pill contains 0·025 gm. of iron. *P. G.*

Mel despumatum, U. S. Mel depuratum, *P. G.*—The latter authority gives no process, but requires this preparation to be clear, of the

density of 1·30, of an agreeable honey odor and in a stratum of 20mm. ($\frac{4}{5}$ inch), of a yellow or slightly brownish color. When mixed with an equal part of ammonia water the color should not be altered (absence of foreign coloring matters); with two parts of alcohol no turbidity should be produced (absence of dextrin); diluted with 4 parts of distilled water, the liquid should be clear and neutral and should become merely opalescent with silver nitrate or barium nitrate (absence of molasses and glucose, which contain chlorides or sulphates).

Mel Rosæ, U. S. Mel rosatum, *P. G.*—Percolate red rose petals 8 parts with diluted alcohol; reserve the first 3 parts of the tincture; evaporate the remainder to 5 parts and mix the whole with clarified honey 92 parts. *U. S.*—Macerate for a day pale rose petals 1 part with water 6 parts, express, evaporate to a syrupy consistence, add 5 times the weight of alcohol, filter, add honey 10 parts and evaporate to 10 parts. *P. G.*

DISTRIBUTION OF PEPTONE IN THE ANIMAL BODY.

By F. Hofmeister.

Nothing has as yet been accurately determined in regard to the way in which nitrogenous nutritive principles absorbed from the alimentary tract are disposed of in the system.

Peptone has always been looked upon with special interest amongst the products of the digestion of albumin, and Schmidt and Mülheim ("Du Bois Reymond's Archiv für Physiol.," 1879, 39) have established by their observations the fact of the transformation in chief part of albumin into this body. It has generally been believed that peptone, being relatively of easy diffusibility, passes through the alimentary mucous membrane into the blood-vessels, and is then carried to the place of its assimilation. Support to this view was given by the observations of Drosdoff and Plósz and Gyergyai, who found peptone in the blood of the portal vein. The quantity was, however, very small. Two different modes of explanation of these facts present themselves: either very little unchanged peptone reaches the blood through the intestinal mucous layer, or the peptone undergoes transformation immediately after its passage, losing its own characteristic properties, and so ceasing to be recognizable. The latter view has hitherto been chiefly adopted, some observers ascribing the place of change to the muscular tissue, and especially to the liver and other

cellular organs, while others have deemed it to occur in the blood itself.

The author does not agree with either of these views, owing to the circumstances that when peptone is introduced into the circulation in some other way than by absorption from the intestine, by direct injection, for instance, the greatest part escapes unchanged in the urine. This would point to the intestinal mucous membrane itself as the place of actual transformation.

In the first place, it was necessaay to ascertain the normal distribution of peptone in the body at successive stages of the process of digestion, so as to exclude the possible influence of other organs besides the intestine and the blood, on the destiny of peptone.

The experiments were made upon dogs fed upon flesh, which was killed at different periods of the digestive process by means of blood letting. The amount of peptone was then determined in the various organs. The blood, heart, lungs, stomach, large and small intestines, liver, pancreas, spleen, mesenteric glands, mesentery, kidneys, and brain were severally examined. The method followed by the author is given in the present and also in a previous memoir (1881), to which the reader is referred for details.

The results of these experimental observations showed that only in one locality was peptone to be constantly found, in the intestinal mucous membrane. The proportions varied in different parts of the alimentary tract.

In the stomach the amount of peptone did not appear to have any ratio to the progress of digestion, save that in the case of long deprivation of food it sank to the limits of recognition. In the small intestines, on the contrary, a regular increase in the amount of peptone up to the eleventh hour after food was given was observed, followed by a diminution; the formation of peptone in the small intestines was *pari passu* with its absorption by the mucous layer. These observations agree with those of Schmidt-Mülheim, and likewise with those of Panum and Falck, in which the excretion of urea in flesh-fed dogs attained its maximum at the same period. This analogy between the formation of peptone and excretion of urea would favor the acceptance of the view that much of the absorbed peptone is at once broken up into its final products.

The total amount of peptone in the alimentary walls, including stomach and intestines, is more than double that present in the blood

as a whole. The proportion of peptone found in the walls of the small intestine was 14 times greater than that in the walls of the stomach. On the other hand, the proportion of peptone in the gastric cavity was 15 times that present in the gastric mucous membrane. Either the stomach plays a much less part in the absorption of peptone than the intestine, or the absorbed peptone disappears more quickly from its mucous membrane.

Next to the intestinal tract, the blood exhibits a pretty regular proportion. Schmidt-Mülheim had already shown that in the case of dogs 24 hours after being fed, the blood coutains no peptone.

Although in the majority of cases the blood is found containing peptone, yet on three occasions out of eleven, negative results were yielded from four to six hours after food. It would appear that the circulation of unchanged peptone is not indispensably necessary to nutrition. The peptone present in the blood is never of significant amount, ranging from 0·029 to 0·055 per cent. with a well-marked maximum seven hours after food. Experiments tend to establish the fact that the peptone in the blood is not dissolved in the serum, but is associated with the red corpuscles.

When peptone was absent from the blood it was never present in the spleen. Contrary to the results of Plzós and Gyergyai, peptone could not be detected in the liver or mesenteric glands.

From the above observations it is inferred that the transformation of peptone takes place either in the mucous membrane itself or immediately after reception by the blood.

During the act of digestion, the stomach of a dog was opened along the smaller curvature, spread out and then divided by a suture carried from the pylorus to the cardiac end into two halves as nearly as possible symmetrical. It might be anticipated that when the viscus was carefully freed from adhering contents, both portions would yield equal proportions of peptone. This, however, is true only when both are simultaneously immersed in boiling water. Should one be left undisturbed for a time, its peptone will be found to diminish in a remarkable manner, and even wholly disappear.

This disappearance of peptone is a vital act, taking place according to the stage of digestion with unequal rapidity, and arrested by heating for a few minutes to 60°C. If the stomach, previously extracted and wiped dry, be placed in the moist chamber for one or two hours at 40°, the mucous membrane is further observed to secrete a fresh

layer of mucus, and the muscular contraction to restore the stomach to its original condition.

Since the transformation of peptone also takes place in the stomach of bled animals, it follows that the blood has no share in the result. The cause is to be sought for in chemical changes which have their seat in the gastric mucous membrane. An explanation is thus afforded of Salvioli's experiments ("Archiv f. Physiol.," von Du Bois-Reymond, 1880, Supplement Band 112), in which it was observed that peptone introduced into the intestine disappeared in a few hours without being detected in the efferent venous blood, whilst no such disappearance took place when blood injected with peptone circulated through the intestinal vessels. It also proves that the property of assimilating peptone belongs not merely to the stomach, but is a common characteristic of the intestinal mucous membrane.

Whether this assimilation is accompanied by a re-formation of albumin or by a complete disintegration, or in what part of the mucous layer it takes place, whether in the epithelial cells of the glandular portion, or the lymph cells of the adenoid tissue, has not yet been determined. But to this the author hopes shortly to proceed.—*Jour. Chem. Soc.*, 1883, p. 675–678: *Zeitschr. Physiol. Chem.*, vi, 51–73.

THE ACTION OF SOME POLYHYDRIC ALCOHOLS UPON BORAX.

INCLUDING THE CHEMISTRY OF GLYCERINUM BORACIS AND MEL BORACIS.[1]

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The experiments described in this paper had for their object the elucidation of the general character of the reaction between polyhydric alcohols and sodium pyroborate (borax). In the instance of one of these alcohols, namely, glycerol (glycerin), the reaction has been studied by my friends, Dr. Alfred Senier and Mr. A. J. G. Lowe, who have already published some results to which I shall subsequently allude. They have since been independently engaged in a much more

[1] The part of this investigation which concerns the chemistry of Mel Boracis formed the subject of a Report upon Organic Chemistry to the School of Pharmacy Students' Association, on May 24, 1883.

detailed inquiry into this same reaction. This inquiry is still in progress, but I learn that some of the results are similar to those described in this paper. It will be convenient here to recapitulate the principal work which has been done upon this subject.

In 1877, Iles (*Chem. News*, xxxv, 204) recorded the fact that a mixture of borax with glycerin imparts a green color to the flame, and proposed to utilize this fact as a test for borates.

In 1878, D. Klein (*Bull. Soc. Chim.*, xxix, 195) showed that when certain polyhydric alcohols are added to a solution of borax an acid reaction is the result; this was observed with glycerol (glycerin), mannitol (mannite), erythrol (erythrite), levulose, dextrose, *a*-galactose and *β*-galactose. A special study was made of the reaction in which mannitol is involved, and published in the same year (*Bull. Soc. Chim.*, xxix, 357). Klein found that when half a molecular weight of borax is dissolved in water and added to one molecular weight of mannitol, also in aqueous solution, the resulting liquid is neutral; but when the quantity of borax added was less than this quantity, the liquid is acid. From the neutral liquid a compound was obtained of one molecule of borax with one molecule of mannitol. From the acid liquid, after fractional precipitation with alcohol of different degrees of strength, a residue was obtained which was very acid, and was supposed to be a compound of mannitol with boric acid, but was not further examined. By heating together mannitol and boric acid to 150° C. for seven or eight hours, treating the resulting substance with water and barium carbonate, and subsequently purifying by precipitation with alcohol, a substance was obtained which Klein calls barium biboromannitate

$$\left.\begin{matrix} C_{12}H_{12}O_{10} \\ 2\ BO_3 \end{matrix}\right\} BaO$$

This was decomposed by sulphuric acid, yielding a compound which crystallized into needles, but did not receive further investigation. The results of Klein's work which bears upon the present question amounted to showing that when mannitol is added to an aqueous solution of borax two compounds are formed depending upon the amount of mannitol present. If the borax be in excess, a compound of borax and mannitol, molecule for molecule, results; if the mannitol is in excess, a compound with boric acid is formed, the exact composition and properties of which were not determined, analogy leading to the supposition that it was a conjugate acid.

In the same year, Senier and Lowe (*Pharm. Journ.*, [3], viii,

819) published the results of experiments on the action of glycerol upon borax, from which it appeared that free boric acid was liberated and a more basic borate formed. Experiments made with a view of isolating the free boric acid, either directly or indirectly, gave negative results. These same observers (*Journ. Chem. Soc.*, xxxiii, 438, *Am. Jour. Phar.*, 1883, p. 483) proposed to utilize the fact that a mixture of glycerol and borax yields a green color to the flame as a test for glycerol, for they found that the reaction was not shared by the majority of polyhydric alcohols, erythrol and glycol alone resembling glycerol in this respect. In 1881, Donath and Mayrhofer (*Zeits. für anal. Chem*, xx., 379) found that the acid solution resulting from the action of glycerol upon borax became alkaline when heated, and proposed this reaction as a test for glycerol. In 1882 (*Pharm. Journ.*, [3], 257, *Am. Jour. Phor.*, 1882, p. 537), I showed the limits of this test and proposed a new method of applying it, at the same time pointing out that it could not be relied upon as a distinctive test for glycerol unless special precautions were taken to exclude other polyhydric alcohols, for I had found that the same reaction was given by mannitol, erythrol, guaiacol, pyrogallol, saligenol, dextrose, levulose, lactose and mycose, and in fact might be considered to be characteristic of all polyhydric alcohols. Since that time my work has been extended with the view of discovering the *rationale* of the general reaction.

Action of Glycerol upon Borax.—When anhydrous borax and anhydrous glycerol, the latter in excess, are heated together the mixture becomes acid and imparts a vivid green tinge to the flame. Anhydrous borax and anhydrous glycerol, the latter slightly in excess, were heated to a temperature of 120° C. As the temperature neared 100° C. water began to be abundantly given off, but it was necessary to raise the temperature to 120° C. in order to effect entire expulsion of the water. Very many experiments were made with varying quantities of the two substances to estimate the amount of water given off and so to determine the formula of the compound produced, but no reliable results were obtained, owing to the inevitable loss of glycerol at this temperature. The mass obtained in the above manner, and which gave the boron flame reaction, was reduced to powder and extracted with ether, which removed a glassy, uncrystallizable, extremely deliquescent body. It was freely soluble in alcohol and was left as a gummy film after the spontaneous evaporation of the alcohol. Upon

treatment with a small quantity of water it yielded a mass of crystals which were recognized by the usual tests as boric acid. The original substance imparted a vivid green tinge to the flame, was not appreciably acid to test paper, but on moistening the paper with water became powerfully so. The acidity of the aqueous solution was not affected by ebullition. In another experiment a mixture of anhydrous borax and anhydrous glycerol was heated to 120° C., the borax being in excess; the mass upon extraction with ether yielded the body just described. It was in like manner decomposed by water, and glycerol was found in the aqueous solution by mixing with lime, drying and exhausting with ether. Absolute alcohol also extracted this substance without decomposition from the original mass, but in this case it was associated with sodium borate. The residue, after extraction with ether, was found to contain a basic borate, probably sodium metaborate. The above experiments are conclusive in showing that the primary action of glycerol upon sodium pyroborate under the above conditions results in the formation of a compound which is evidently a boric ether of glycerol, that is, glycerol in which some of the hydroxyl has been displaced with the formation of water by the boric radical. This ether may be termed *glycerol borin*. It is decomposed by water, forming boric acid and regenerating glycerol; hence the acidity of aqueous mixtures of glycerol and borax. The glycerol borin produced in the manner above described agrees in its main properties with the boric ether of glycerol isolated by Schiff and Becchi (*Compt. Rend.*, lxii, 397) from the action of heat upon a mixture of glycerol and boric acid, which was represented by the formula, $C_3H_5BO_3$. Glycerol, then, acts upon sodium pyroborate, combining with half the boric anhydride which the salt contains to form glycerol borin, sodium metaborate remaining.

Action of Mannitol upon Borax.—The experiments of Klein upon this subject, which have been previously described, are open to the objection that water was employed in order to obtain the final products. My previous experiments with glycerol had shown that water annihilates the glycerol borin which results from the action of glycerol upon borax, and therefore had a similar ether been produced in the present instance it would have been *ex hypothesi* decomposed by the water employed in Klein's experiments. For this reason, my experiments in the first place were made in such a manner as to exclude the use of water. Anhydrous mannitol and anhydrous borax, the former being

slightly in excess, were heated together to a temperature of 140° C. The deliquescent mass thus obtained, which gave no green flame reaction, was extracted with anhydrous ether. The ethereal solution upon spontaneous evaporation yielded a body which apparently crystallized in feathery tufts and gave an intensely green flame reaction. Absolute alcohol extracted from the original mass the same substance, together with unaltered manitol and sodium borate. The body thus obtained was easily soluble in absolute alcohol and this solution was faintly acid in reaction. Water likewise dissolved this substance, and the aqueous solution, which was strongly acid, yielded the reactions for boric acid and also for manitol. The residue which had been extracted with ether was found to contain sodium metaborate. An aqueous solution of borax was treated with an aqueous solution of mannitol, until strongly acid, and evaporated to dryness; then exposed for some time to a temperature a little exceeding 100° C. Ether extracted from this mass the substance above described. These experiments indicate that the action of mannitol upon borax gives rise to the formation of a boric ether in which some of the hydroxyl of the manitol is replaced by an equivalent amount of the boric radical. This substance, which may be termed *mannitol borin*, is decomposed by water, yielding manitol and boric acid; the acidity of aqueous mixtures of mannitol and borax is, therefore, due to this acid. There are probably many secondary reactions involved when aqueous mixtures of mannitol and borax react and some of these doubtless give rise to the formation of the bodies described by Klein. It has already been observed that a mixture of mannitol and borax, unlike a mixture of glycerol and borax, does not impart a green color to the flame, although, as the above experiments show, a substance possessing this property, namely, mannitol borin, is present in the mixture. Klein (*Bull. Soc. Chem.*, xxix, 368) supposes that this is due to the interference of mannitol, which, acting like tartaric acid, masks the green flame reaction of boric acid when heated with it. This is a possible explanation, but the fact may also be due to dissociation, as I have shown that it is in the instance of a similar phenomenon which will be considered later on.

Action of Dextrose upon Borax.—The first experiments upon this subject were made with commercial glucose. An aqueous solution of this substance was mixed in excess with an aqueous solution of borax until the mixture was strongly acid; the solution was evaporated to

dryness and the residue heated for some time at 110° C. The mass thus obtained did not give any green flame reaction and was not acid. It was extracted with absolute ether and the ethereal solution upon evaporation left a white residue which imparted a vivid green tinge to the flame. This substance was easily soluble in alcohol and this solution was only faintly acid; it also dissolved readily in water, and this solution, which was strongly acid in reaction, deposited crystals of boric acid and gave plentiful evidence of glucose with Fehling's solution. From the original mass absolute alcohol extracted the same substance in an impure condition. These experiments were now repeated with pure dextrose, the dextrose and anhydrous borax, the former slightly in excess, being heated together to about 140° C. Absolute ether extracted from this mixture a substance which behaved in precisely the same manner as that obtained from commercial glucose. The residue contained sodium metaborate.

The above experiments show that dextrose decomposes borax, forming a compound which is probably a boric ether similar in character to those ethers which have been obtained from glycerol and mannitol; sodium metaborate is at the same time produced. This ether may be termed *dextrose borin*. It also follows from the above experiments that the acidity produced when aqueous solutions of dextrose and borax are brought together is due to boric acid. A mixture of dextrose and borax resembles a mixture of mannitol and borax in giving no flame reaction for boric acid and probably for the same reason.

Action of Levulose upon Borax.—Pure levulose was prepared from invert sugar by Dubrunfaut's method. It was heated with a small quantity of anhydrous borax to a temperature of 120° C. and extracted with absolute ether. In this way a substance was obtained which behaved in the same manner as the similar body obtained by the action of dextrose upon borax. An aqueous solution of levulose was added to an aqueous solution of borax until a strongly acid reaction prevailed. The liquid was evaporated to dryness and heated to 120° C. until all the water was expelled. Ether extracted from this mixture the same compound that was obtained by heating the anhydrous substances together. Sodium metaborate was found in the residue which had been extracted by ether. Thus levulose decomposes borax, forming a compound, probably boric ether, which is decomposed by water, yielding boric acid and regenerating levulose; it may be termed *levulose borin*. An aqueous solution of borax to which excess of levulose

has been added consequently contains boric acid, but yet this solution gives no flame reaction for boric acid.

The Chemistry of Mel Boracis.—In connection with the above results it was interesting to examine the mel boracis of the British Pharmacopœia which is practically a solution of borax in honey. Mel boracis in its normal condition is acid in reaction, but gives no flame reaction for boric acid. If some of it be mixed with a small quantity of water it is found to be strongly acid, but if a large excess of water be added it becomes alkaline. Some mel boracis was exposed at a temperature a little exceeding 100°C. until all the water was expelled. The resulting mass was powdered and exhausted with absolute ether, which removed a substance which imparted a vivid green tinge to the flame. This substance was soluble in absolute alcohol and also in water; this latter solution was strongly acid and contained a sugar which reduced Fehling's solution. Strained honey was found to be slightly acid; this acidity was neutralized by the addition of sodium carbonate. The faintly alkaline honey thus obtained was added to a solution of borax, which is also alkaline; an acid reaction ensued, which was destroyed by heat, the solution becoming alkaline but regaining the acidity on cooling. The liquid gave no green flame reaction. A saturated solution of borax was mixed with faintly alkaline honey until acidity was strongly developed and slight excess of honey had been added. No green flame reaction could be obtained with the solution, although a great number of trials were made. The solution was evaporated to dryness until all the water had been expelled. The mass so obtained was not acid in reaction, neither did it become so upon the addition of absolute alcohol; contrariwise the addition of a small quantity of water caused the development of a marked acid reaction. The mass gave no flame reaction for boric acid. After powdering, it was extracted with absolute alcohol, which upon evaporation left a residue consisting of some unaltered honey together with a body which apparently gave a green flame reaction, although the color was much masked by the honey present. Another portion of the mass was exhausted with ether, which extracted a substance giving a vivid green tinge to the flame of a Bunsen lamp. It dissolved readily in absolute alcohol and this solution was only faintly acid. The substance readily dissolved in water yielding a strongly acid solution, the acidity of which was unaltered by boiling. The aqueous solution readily reduced Fehling's solution. The mass after extraction was found to contain

sodium metaborate. These results agree precisely with those predicted from previous observation of the action of dextrose and levulose upon borax. Thus the acidity of mel boracis is due to boric acid which has been produced by the action of the dextrose and levulose contained in the honey upon borax in presence of water. Mel boracis also contains sodium metaborate.

Elucidation of a Secondary Reaction.—I have previously shown ("Pharm. Jour." [3], xiii, 257) that it is a property characteristic of polyhydric alcohols to render a solution of sodium pyroborate, which is normally alkaline, acid in reaction, the original alkalinity being restored upon heating. Since that time I have had the opportunity of trying this reaction with some pure glycocine (prepared by Mr. T. S. Dymond), a substance which resembles dextrose and allied carbohydrates in its principal properties. This substance, unlike dextrose, did not yield the reaction with sodium pyroborate, in accordance with the prevision from the fact that it is not a polyhydric alcohol but amido-acetic acid (CH_2NH_2COOH).

This altogether interesting and anomalous behavior of the polyhydric alcohols towards a solution of sodium pyroborate, I am now, after having made clear the general nature of their action upon this substance, able to explain. The experiments now described show that these alcohols in presence of water liberate boric acid from sodium pyroborate, sodium metaborate being at the same time produced. It seemed probable that this characteristic behavior was in reality due to a secondary reaction occurring between the free boric acid and the sodium metaborate and was in no way directly affected by the presence of polyhydric alcohol. Subsequent experiment has completely confirmed this conjecture. The pure sodium metaborate ($NaBO_2$), the aqueous solution of which is alkaline, was very faintly acidified by the addition of boric acid; this solution as it was slowly raised to the boiling point gradually regained its alkalinity, which again disappeared as the liquid became cool, the indications being observed with the aid of phenol phthalein.

The addition of large excess of water produced an effect similar to that of heat. These same phenomena are observed when sodium pyroborate, the aqueous solution of which is likewise alkaline, is substituted for sodium metaborate and when other acids are employed in the place of boric acid. Let a solution of sodium pyroborate be made neutral or faintly acid with boric or with hydrochloric acid and the

alkalinity is reproduced by heating but is again destroyed as the temperature of the solution is lowered. Water also is able to annihilate the acidity and reproduce the alkalinity of the liquid. Now when sodium metaborate or pyroborate is dissolved in water dissociation occurs, resulting in the formation of an acid borate or boric acid and the liberation of free alkali;[1] hence the alkalinity of such solutions. Upon adding acid in sufficient quantity to neutralize this alkalinity, a stable neutral system is the result. The addition of more water disturbs this system of neutrality, by producing further dissociation of the salt indicated by renewed alkalinity. A rise of temperature produces in this neutral solution the same effect as excess of water, namely, alkalinity, which, however, disappears as the solution cools, the heated water effecting dissociation, and recombination occurring as the liquid cools.

If excess of acid be added no change is observed upon heating, doubtless because acid, and therefore more stable, salts are produced. It follows from these experiments that when a polyhydric alcohol is added to an aqueous solution of sodium pyroborate in quantity just sufficient to produce an acid reaction due, as we have previously seen, to the liberation of boric acid from some of the sodium pyroborate with formation of sodium metaborate, upon the addition of more water or application of heat dissociation of the undecomposed sodium pyroborate and metaborate takes place, liberating alkali in quantity more than sufficient to neutralize the free acid, hence the liquid is alkaline. As the temperature is lowered recombination takes place with the consequent regeneration of the original neutrality or faint acidity. If excess of the polyhydric alcohol be added, that is, more than enough to render the liquid neutral or faintly acid no reaction is produced upon the heating, evidently because excess of boric acid has been set free.

General Considerations.—The chief result of this inquiry is to show that polyhydric alcohols decompose sodium pyroborate with the for-

[1] Berthelot has shown ("Essai de Mécanique Chimique," vol. ii, 225) that increased addition of water produces increased dissociation; thus when boron trioxide combines with sodium oxide to form sodium metaborate ($B_2O_3+Na_2O$) in presence of 220 molecules of water, 11·75 heat units are liberated.

$B_2O_3+Na_2O$ in presence of 330 H_2O liberates 11·56 h.u.
$B_2O_3+Na_2O$ in presence of 440 H_2O liberates 11·13 h.u.
$B_2O_3+Na_2O$ in presence of 1320 H_2O liberates 10·91 h.u.

mation of sodium metaborate and a boric ether or, if water be present, free boric acid. There are no doubt many secondary reactions involved; in fact, one such reaction has just been under discussion. The principal properties of these bodies have been described, but whether they are mono-, di-, or tri-borins, has not directly been determined. In the case of glycerol, however, there can be little doubt that the substance produced is glycerol in which all the three hydroxyl groups are substituted by the boric radical ($C_3H_5BO_3$). The following equations symbolize the action of glycerol upon sodium pyroborate and similarly other polyhydric alcohols:

$$2C_3H_5(OH)_3+(2NaBO_2.B_2O_3)=2C_3H_5BO_3+3H_2O+2NaBO_2.$$

But inasmuch as water itself is a product of the decomposition, the above reaction is never complete save at high temperatures, owing to the conversion or partial conversion of the borin into boric acid under the influence of the water, thus[1]—

$$C_3H_5BO_3+2H_2O=C_3H_5(OH)_3+H_3BO_3.$$

In aqueous solutions the reaction may be thus represented in one equation—

$$2C_3H_5(OH)_3+(2NaBO_2,B_2O_3)+3H_2O=$$
$$2NaBO_2+2H_3BO_3+2C_3H_5(OH)_3.$$

This is a reaction, which, taken by itself, might be attributed to what has been called "catalysis," for the glycerin remains unchanged at the close of the reaction. It is, however, now manifest that the production of a boric ether is the determining cause of this reaction, which is thus brought under the category of chemical action and the use of a fictitious explanation, if at any time legitimate, is here rendered superfluous.

Not only are the results of this investigation interesting on the side of the polyhydric alcohols but also as additional evidence in favor of regarding anhydrous borax as a sodium pyroborate; that is, a compound of boric anhydride with sodium metaborate.—*Pharm. Jour. and Trans.*, July 21, 1883.

[1] *Cf.* the experimental investigations of Berthelot ("Ann. Chim. Phys." [3], lxv, lxvi, lxviii); Menschutkin ("Ber.," x, 1728) on "Etherification;" also the admirable discussion of the whole subject by Berthelot ("Essai de Mécanique Chimique," vol. ii, pp. 79–95).

THE EFFECT OF ALTITUDE ON THE ALKALOID OF RED BARK.

BY J. E. HOWARD, F.R.S.

I beg to forward the inclosed published communication from Dr. Trimen, which will interest many of your readers and sustain the character of your Journal as the best repertory of information on the important subjects of which it treats.

It gives me pleasure to see that "the relationship of the alkaloids" is brought under notice in Dr. Trimen's letter. It is long since I worked at this in conjunction with Dr. Herapath, and much of the information then published is probably forgotten; and much that was inferred relative to the manner in which the molecules appear to be built up in nature (bearing on the possibility or otherwise of the artificial production of quinine) remains for further investigation. I can only remark, at present, on the universality of the relationships thus disclosed by the ray of polarized light.

The relationship is this:

Lævogyrgate.	Dextrogyrate.	Feebly Dextrogyrate.
Quinine.	Quinidine.	Quinicine.
Cinchonidine.	Cinchonine.	Cinchonicine.

Dr. Herapath, in his "Researches on the Cinchona Alkaloids" ("Proceedings of the Royal Society," November, 1857), attempted to demonstrate this relationship on chemical grounds; and even thought that quinine and cinchonidine might be mutually convertible. He observes that "closely as the quinine and cinchonidine salts agree amongst themselves, they differ widely from the quinidine and cinchonine compounds."

In order to confirm the interesting experiments instituted by Dr. Trimen, I selected specimens given me by Dr. Morris, Jamaica, of red bark grown under somewhat similar differences of altitude; that from the lower elevation having (as in India) the best appearance; that from the higher the richer produce. I shall send portions of these to the Museum.

The bark from which the second sample was taken proceeded from trees grown in the parish of Manchester at an elevation of about 2,400 feet. This is the lowest elevation at which cinchona bark trees have been cultivated in Jamaica. The trees were between eight and nine years old, growing in a sheltered situation and on a good

strong red soil; the mean annual rainfall about 90 inches, and the mean annual temperature about 73° F.

As this elevation is intermediate, so the alkaloids hold a consistently intermediate position between the two samples of Ceylon bark, perhaps with a slight exception as to the amorphous alkaloid. If the circumstances of growth in other respects had been the same as in India, it is probable that the amount of quinine in the Jamaica sample of 6,000 feet would have increased at the expense of the amorphous alkaloid. As it is, the Jamaica bark at this elevation scarcely equals expectations, although the botanical samples are very true to type.

Analyses of samples of *Cinchona succirubra*, sent by Drs. Trimen and Morris, at different elevations:—

Elevation above sea level.	Place of growth.	Quinine.	Cinchonidine.	Cinchonine.	Quinidine.	Amorphous.	Total alkaloids.
A. 5,500 ft. . .	Hakgala,	2·06	3·47	0·61	Traces	0·66	6·80
5,500 to 6,000	Jamaica,	1·76	3·17	0·75		0·75	6·43
2,400 . . .	Jamaica,	1·50	0·86	3·06	0·06	1·13	6·61
B. 1,500 ft. . .	Peradeniya,	0·47	0·05	1·67	0·30	1·06	3·55

The *succirubra* is, however, the wrong sort to cultivate, and (except only as regards the bark *renewed* in McIvor's method) will always be found disappointing. The *shaving* process is incomplete. It is requisite that the bark should be stripped in the wet line of the cambium. The tree then begins *de novo*. An exudation is thrown out from the peeled surface, "like the perspiration from the back of the hand," as McIvor described it to me. The formation is then *radial*, and not concentric (see Fig. 5 and 6 of Plate III of my "Quinology"), with abundance of cellular tissue and a consequent complete change in the alkaloids. I have objected to the *succirubra* from an early stage in the culture, but opposite counsels prevailed. The prices obtained for very inferior bark now sent home may perhaps show the planters that it would have been more to their interest to cultivate the better sorts—*Pata de Gallinazo* introduced together with *succirubra* by Cross, the *magnifolia* (Uritusinga?), the *robusta*,—known to them, but neglected till lately. I have just received an account of the 1882 harvest of bark in Java, from which I learn that 763 bales of all sorts of succirubra bark gave on an average of 28 analyses 1·04 per cent. of quinine; but of this two lots were of "*renewed*" bark, respectively 2·2 and 2·4 per cent., and deducting these, the percentage falls to 0·94 of quinine. This culture

can hardly be profitable for quinine manufacture,[1] nor yet for pharmaceutical purposes, as I have shown first in my "Quinologia," 1862, and many times since, that the "red bark" contains a *distinctly noxious ingredient* not found in the barks better adapted for medicinal use.

The tests of the inferior Calisaya, Schukraft, Savanica, and Anglica, are about 1 per cent. of quinine. Surely this cannot pay *at present;* but, even if it does, how will such plantations compete in future with the immense cultivation commencing elsewhere. Of course in Java the redeeming feature is the *Ledgeriana;* the *officinalis* seems also to promise well.

The result of these trials seems to prove that elevation above the sea level is far more important than all the other factors in the problem, but why this should be so, I confess I do not see. The true home of the Cinchona is in the clouds; direct scorching sunlight is fatal.

I am at this moment observing with interest the effect of light on some Cinchonas. In the early part of last year I sowed, almost at the same time, seed of the true *Ledgeriana* from the Yarrow estate in Ceylon, derived from trees yielding from 7 to 12 per cent. of quinine, and also seed kindly given me by Mr. Christy, from Bolivia, of the best kinds there cultivated. I watched with interest the development of the young plants, which for a considerable time entirely resembled each other—only that I found the *Ledgeriana* the more sensitive to surrounding influences. After some months' growth the Bolivian seed began to develop the characteristics of the *verde*, *morada*, and the *rubra venada* of Bolivia; whilst the *Ledgeriana* showed features of difference, though at the same time of close affinity. This was shown, amongst other things, by the rich velvety surface of the leaf, marking the best Calisayas,[2] as also by a delicate fringe of hair at the edges of the leaves. But now that the more flourishing plants are some ten inches in height (the *rubra venada* twenty), further diversities appear. The leaves of

[1] See the Blue Book of Indian Government (June 18, 1866, p. 134), in which, after analysis of the first parcels sent home, I observed the great preponderance of cinchonidine, and notified to the Indian Government "This difficulty must be looked steadily in the face, and I would suggest that it may be obviated, either by a change being wrought in the opinion of the medical world as to the value of cinchonidine as a medicine, or by the plant being encouraged to produce quinine instead of cinchonidine." This latter Mr. McIvor afterwards succeeded in effecting by his renewing process. The Government also acted on my former suggestion.

[2] See Weddell's "Histoire."

the *Ledgeriana* turn *red* in fading, which is said by Mr. Ledger to be characteristic of his "rojo" (*roxo*) at the flowering season, from which it derives its name "*red*."

They are more delicately formed than the others I have named, and more easily damaged by direct sunlight. As night approaches, the top leaves gradually change their position, approaching each other so as in some cases almost to fold together. This is well shown in a fine plant of true *Ledgeriana* which I have from Darjeeling, and also in the more flourishing of my plants from Ceylon. I do not notice the same in the *verde* from Mr. Christy's Bolivian seed, of which the leaves are more robust, but the above features are not *confined* to the "rojo."

These peculiarities would scarcely be seen unless the plants were well developed under glass, but once observed it is impossible to forget or to confuse these rich varieties of Calisaya (which I described and figured as such from well ascertained specimens sent by M. Moens) with the plant described and figured by Dr. Trimen as "*C. Ledgeriana*, Moens," and which I should call *C. micrantha*, var. *Calisayoides*. Dr. Trimen had not the opportunity of comparing the plates drawn by Fitch, in my "Quinology," with those in the *Journal of Botany;* but the distinction is most evident, as I have endeavored to demonstrate to the Linnean Society. My figures of *C. Calisaya*, var. *Ledgeriana*, are from trees yielding respectively (Pl. IV.) 9·06, (Pl. V.) 9·90, and (Pl. VI.) 9·97 per cent. of quinine and the fruit-bearing branch 10·90 (same plate). See the account of my herbarium, pp. 58–66.

The "rojo" (*roxo*), or *C. Calisaya*, var. *Ledgeriana*, is the queen of all the Cinchonas; but certainly possesses a delicate organization which makes the cultivation difficult. The "verde," as being a quick growing tree, flourishing at lower elevation, is found in Bolivia more profitable to cultivate than the "morada," although the latter is richer in percentage of quinine. I do not think that the *Ledgeriana* is cultivated in Bolivia, but another sort of "rojo" is extensively planted in Coroico, in the Yungas of Bolivia. "This is not so good as the Caupolican rojo." It is the *Colorada naranjada*, or *orange peel red*, only known to me by the bark, which has a character peculiarly its own. The bark of the *Ledgeriana* is most characteristic. It is thick and composed almost entirely of cellular tissue; quite contrasted with that of the "verde," which bears the stamp of more vigorous growth and

has a more fibrous structure and less alkaloid. This last has for many years been familiar to me in importation from South America.

But I must defer for the present any further remarks.

From a letter from Mr. Ledger, February 7, 1881:—

"I repeatedly used to joke poor Manuel when he used at first to tell me the trees from which the thick, heavy slabs of bark (in fact the *Rojo*) came from had white flowers. The *Rojo* from Coroico and in South Yungas, though with purple red leaves underside [the *morada*], are nothing to be compared with the *Rojo* of Caupolican and Apolobamba. The *Rojo* or *Ledgeriana* is very little known in Bolivia even. According to Manuel this tree is never met with in *Manchas* (patches) like the other classes of Cinchona. It is found by itself here and there. With all cascarilleros from Pelechuco a '*slab*' *of Calisaya rojo* means *unsurpassable*, and is meant to say, where that is, all the rest is good or Calisaya."

(From *Ceylon Observer*, April 9, 1883.)

THE EFFECT OF ALTITUDE ON THE ALKALOIDS OF RED BARK.

SIR.—Everything that may throw any light upon the relationships of the cinchona alkaloids, or on the causes which influence their production, is of much interest; it also has a practical value to cultivators. I therefore no longer delay in making public the results of two remarkable analyses of Ceylon *C. succirubra*.

With the object of ascertaining the effects of altitude on the alkaloid production of this species, I, towards the end of last year, barked two trees growing respectively at elevations of 5,500 (Hakgala) and 1,500 (Peradeniya), a difference of 4,000 feet. The trees were, I have every reason to believe, of common origin; both being, in all probability, raised from the original seed collected in South America by Dr. Spruce, and planted out in the midst of other trees, in or about 1863. They were therefore about nineteen years old reckoned from the planting, and both had grown up under fairly similar conditions, excepting as regards climate. Their growth, however, had been very different. The tree at Hakgala was one of the largest there, 37 feet high to the point where the stem was but 1 inch in diameter and 37 inches in girth at the base, lessening to 24 inches at 5 feet from the ground. It afforded 25 lbs. of dry bark (77 lbs. of wet), and the sample sent home was large quill 18 inches long, with a "brown coat." On the other hand, the Peradeniya tree, though not far off from the other in height, being drawn up by the large trees around, girthed only about 20 inches near the ground, and yielded about 7 lbs. of dry bark (21 of wet). The sample of small quill sent home was described as having a "grey coat."

It is to my friend, Mr. J. E. Howard, who is ever most liberal in helping to advance our knowledge of quinology, that I am indebted for the following comparative analysis of these two samples. He is himself much interested in the result, and we may, I believe, expect some observations upon it from his pen:

	Quinine sulphate.	Quinine.	Cinchonidine.	Cinchonine.	Quinidine.	Amorphous.	Total alkaloids.
A. Large quill grown at Hakgala, 5,500 feet, . .	2·75	2·06	3·47	0·61	Trace	0·66	6·80
B. Small quill grown at Peradeniya, 1,500 feet, .	0·62	0·47	0·05	1·67	0·30	1·06	3·55

A comparison of these very different analyses suggests many observations. And at first sight we cannot but be struck with the influence for good of elevation in the production of the alkaloids as a whole, nearly double as much being produced in the higher locality. Mr. Howard remarks that as far as the *appearance* of the bark is concerned the contrary was the case, that from the low elevation being the "more attractive to those who judge merely by the eye."

The large amount of quinine in analysis A is also noteworthy in red bark from a tree nearly twenty years old, as showing that there is no necessary diminution of that alkaloid after eight or nine years, as Mr. Broughton was led to believe.

It is, however, as regards the proportions of the alkaloids that the comparison will be found most instructive. In A we have of quinine over 2 per cent., and of cinchonidine nearly 3½ per cent., whilst there is but 0·61 of cinchonine and a mere trace of quinidine: in B the change is very remarkable: quinine has sunk to less than ½ per cent., and cinchonidine to little more than a trace (0·05 per cent.), whilst on the other hand, cinchonine has increased to 1·67 per cent.—that is, about two and a half times as much as in A—and there is also an appreciable amount (0·30 per cent.) of quinidine. It has been remarked[1] that the natural or physiological relationship of the four principal alkaloids of cinchona bark is not expressed by their chemical constitution and terminology. Quinine and quinidine are, as is well known, isomeric chemical bodies, *i. e.*, both have the same empiric formula of composition, $C_{20}H_{24}N_2O_2$, and cinchonine and cinchonidine are similarly related, their common formula being $C_{20}H_{24}N_2O$. But in nature it would appear that the pairs are differently composed, and it is customary to find associated in the tissues, quinine and cinchonidine and cinchonine and quinidine and not the isomeric couples. It is indeed highly probable that, under conditions of oxidation and deoxidation at present not understood, the units in each of these naturally associated pairs are mutually convertible. The analyses before us bring out this association in a very marked manner.

The relationship of the alkaloids, to which attention is here called, is also indicated by the action of their solutions on a ray of polarized light. Quinine and cinchonidine deflect this to the left and are lævo-rotatory, whilst cinchonine and quinidine have a right hand or dextro-rotatory action.

As to the causes which in the case before us have led to the disappearance of the quinine and cinchonidine in the low-grown bark, and their partial substitution by cinchonine and quinidine we have little to guide us,

[1] Mr. Howard especially called attention to this so long ago as 1866 (see "Proc. Bot. Congress in London," p. 198).

but the fact is a very important one as bearing on the cultivation of red bark at low elevations. A similar substitution has been recorded before in old trees, but age alone is seen, by analysis A, to be an insufficient cause. It is probable that temperature is the more important factor, and support is given to this by the remarkable case recorded by Broughton,[1] of the reversed action in *C. peruviana.* This species, as grown at Neddivuttum, is remarkable for affording cinchonine in large quantity—in the experiment recorded 3·84 per cent.—and absolutely no quinine; when grown, however, at the higher elevation of Dodabetta, the cinchonine was greatly diminished, whilst quinine was present to the amount of 0·79 per cent.

I am, sir, yours faithfully, HENRY TRIMEN.

Peradeniya, April 5, 1883.

—*Phar. Jour. Trans.*, June, 1883.

CONSTITUTION OF ATROPINE.

BY A. LADENBURG.

In this paper the author has collected together the various facts on this subject, mostly already published and abstracted (see "Amer. Jour. Phar.," 1879, etc.), and thus gives an historical sketch of this interesting research. When tropine had been recognized as a tertiary base, the author proceeded to synthesize atropine from its products of decomposition, tropine and tropic acid, which he succeeded in doing by the action of dilute hydrochloric acid on tropine tropate. This being accomplished, he next prepared various other alkaloids, called by him tropeines, by a similar method; thus, from tropine mandelate he obtained *homatropine* or *phenylglycolic tropeine* and measurements of the crystals and the following additional observations are now given: the *hydrochloride* crystallizes from concentrated neutral solutions after some time; it is very soluble in water; the *sulphate* can be crystallized from water, and forms needles with silky lustre; solutions of the hydrchloride give a white curdy precipitate with potassium mercuric iodide, a white oil with mercuric iodide, and a crystalline *platino-chloride* with platinic chloride. From tropine atrolactate, *atrolactic tropeine* is obtained. Additional remarks: this substance crystallizes in needles (m. p. 119–120°), very sparingly soluble in cold, but more readily in hot water, and easily in alcohol. It is isomeric with atropine, and its mydriatic action is equally remarkable. The hydrochloride, hydriodide, hydrobromide and sulphate have not been obtained in crystals. The *platinochloride* forms reddish-yellow crystals, very

[1] "Report to Government of Madras," September 26, 1871.

soluble in water and alcohol. The *aurochloride*, $C_{17}H_{23}NO_3AuCl_4H$, crystallizes in yellow needles, which melt under water, but when dry melt at 112–114°, sparingly soluble in cold water. *Salicylic tropeine*, $C_{13}H_{19}NO_3$, is obtained from tropine salicylate; it does not act on the pupils of the eye; the platinochloride has the composition $(C_{15}H_{19}NO_3.HCl)_2,PtCl_4$, the *aurochloride*, $C_{15}H_{19}NO_3.HCl,AuCl_3$. *Hydroxybenzotropeine* can be partially distilled without decomposing, whilst the remainder is carbonized. It has a slightly alkaline reaction, and is soluble both in acids and in soda. It crystallizes without water of crystallization. It does not act on the eye as energetically as atropine. The *nitrate* is moderately soluble, and is colored yellow when boiled with excess of nitric acid. Iodine gives rise to a crystalline mixture of tri- and pentiodide. The *mercuro-* and *stanno-chlorides* have been obtained, the former in colorless leaflets, the latter in tufts of white needles. Other precipitates are formed with tannic acid, potassium mercuric iodide, potassium ferri- and ferro-cyanide, and phosphomolybdic acid. The simple salts of *parahydroxybenzotropeine*, $C_{15}H_{19}NO_3$, are mostly soluble, the *nitrate* crystallizing in prisms only sparingly soluble; this salt is turned yellow by boiling with nitric acid. It gives precipitates with all the various reagents mentioned above; the *merurochloride*, $HgCl_2,C_{15}H_{19}NO_3,HCl,H_2O$, crystallizes in needles.

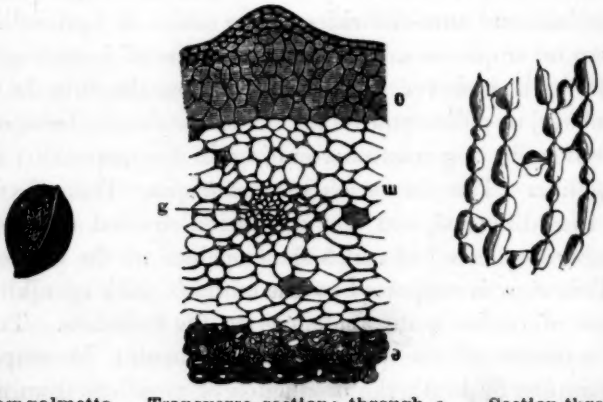
Benzotropeine, $C_{15}H_{19}NO_2$. Additional remarks: it distils without leaving a residue. The nitrate is sparingly soluble, and is turned yellow by boiling with nitric acid. The aurochloride forms microscopic needles, slightly soluble in water, easily in alcohol. It gives precipitate with the usual reagents. *Phenylacetotropeine*, $C_{16}H_{21}NO_2$, sulphate forms colorless needles. *Cinnamyl tropeine*, $C_{17}H_{21}NO_2$, can be prepared either from cinnamic acid, tropine, and hydrochloric acid, or by treating phenylacetic acid in a similar manner. It has scarcely any mydriatic action, but is a powerful poison. *Atropyltropeine* and *phthalyltropeine* are the last of the series of the compounds described in this paper. The author then passes on to his work on the constitution and synthesis of tropic acid, from the results of which he arrives at the constitution $CH_2(OH).CHPh.COOH$ for that acid. With regard to the constitution of tropine, the author finds that when it is heated with soda-lime, *methylamine* and a *hydrocarbon* like tropilidene, C_7H_8, stand prominent amongst the products, so that the principal reaction may be represented by the equation $C_8H_{15}NO=NH_2.CH_3+C_7H_8+H_2O$. When tropine is decomposed with acids, it gives rise to *tropidine;* the best

method for the preparation of this base is to heat a mixture of tropine (2 parts), glacial acetic (12 parts), and concentrated sulphuric acid (46 parts). In addition to the properties, etc., already given, the vapor density has been determined, and found to be 118. Tropidine is soluble in acids, in ether, and alcohol, scarcely soluble in soda; its aqueous solution has a strongly alkaline reaction. *Tropidine hydrochloride* forms hygroscopic crystals, soluble in water. The *hydrobromide* is similar, but not quite so hygroscopic. The *picrate* crystallizes in yellow needles, very sparingly soluble in cold, somewhat more so in hot water. The *periodide* forms brown prisms (m. p. 92–93°), soluble in alcohol. With methyl er ethyl iodide, tropidine yields a mono-methyl or ethyl-derivative, which is crystalline and forms well-defined crystalline platino- and auro-chlorides. The action of hydriodic acid and phosphorus on tropine results in the formation of *hydrotropine iodide* (m. p. 115°); if, however, during the reaction, the tube be heated to 150° or above, tropidine and its periodide are the products, owing to a secondary dehydrating reaction resulting in the conversion of tropine into tropidine. The formation of *metatropine* from hydrotropine iodide is then discussed, and the conclusion arrived at is that tropine is a nitrogenous alcohol of which the tropeines are the ethereal derivatives. This view is supported by the author's work on alkines, which are a class of bodies quite analogous to the tropeines. Then follow detailed accounts of the following experiments: Decomposition of dimethyltropine by heat; the production of tropilene from methyltropidine iodide and tropidene from dimethyltropine iodide; the decomposition of methyltropine, methyltropine chloride and iodide by potash, the principal products being large quantities of *di-* and small of *tri-methylamine;* the oxidation of tropilene into adipic acid, and finally the decomposition of tropidine by bromine, by which *ethylene dibromide* and *dibromomethylpyridine* are obtained. The inferences there deduced are enlarged upon, and the formula $C_5H_7(C_2H_4O.CO.CHPh.CH_2.OH)NMe$, proposed for atropine.—*Jour. Chem. Soc.*, June, 1883, from *Annalen*, 217, 74–149.

GLEANINGS IN MATERIA MEDICA.

By John M. Maisch.

Sabal serrulata, Roemer et Schultes.—The dried fruit of the saw palmetto is described by J. Moeller as being oblong ovate, 10 to 15 mm. ($\frac{2}{5}$ to $\frac{3}{5}$ inch) long, 5 to 9 mm ($\frac{1}{5}$ to $\frac{1}{3}$ inch) broad, bluntly pointed at the base, externally blackish-brown, netted-wrinkled, weighing about .5 gm, inodorous and tasteless, and containing a shriveled seed. The pericarp is 1 mm. thick, and consists of three well-defined layers of nearly equal thickness: the blackish-brown resinous epicarp, the yellowish-green mesocarp, and the yellowish brittle endo-



Fruit of saw palmetto, natural size.

Transverse section; through *e*, epicarp; *m*, mesocarp; *e*, endocarp; *g*, fibrovascular bundle; magn., 125 diam.

Section through horny endosperm; magn., 125 diam.

carp, composed of sclerenchyma. Soaked in water, the mesocarp swells considerably, and somewhat less the epicarp. Both tissues are formed of thin walled cells; those of the latter are filled with a brown mass; those of the former colorless or brownish, and surrounding numerous fibrovascular bundles. The thin walled cells of the testa contain a red brown mass. The endosperm is hard and hornlike, swells rapidly in water, and consists of a peculiar parenchyma, which becomes gelatinous by potassa.

Iron salts color the contents of the cells of the epicarp blue, but scarcely affect those of the testa. The contents of the latter are soluble in alkalies; those of both tissues insoluble in water. The mesocarp contains sparingly groups of calcium oxalate crystals, also rem-

nants of protoplasma, which are also found in the endosperm. Starch is not present.—*Phar. Centralhalle*, 1883, No. 15. For an account of the uses of saw palmetto, see paper by Dr. J. B. Read, in *Am. Jour. Phar.*, 1879, p. 169.

Globularia Alypum.—Heckel and Schlagdenhauffen obtained from the leaves by extracting with carbon bisulphide 2·85 per cent. of extract, consisting chiefly of fat and chlorophyll. Ether took up 2·438 per cent., consisting of coloring matter, a little tannin, globularin, chlorophyll and cinnamic acid. Chloroform yielded 11·365 per cent. of extract, containing tannin, coloring matter, and principally globularin and cinnamic acid. Alcohol now took up 30·55 per cent. of extract, containing, in addition to the principles mentioned, also glucose and mannit. Globularin is amorphous; it is precipitated from its aqueous solutions by iodine, bromine and tannin, but not by metallic salts; mineral acids decompose it into glucose and a resinous body, globularetin. This is soluble in cold alkalies and reprecipitated by acids; but after boiling the alkaline solution, acids produce a crystalline precipitate of cinnamic acid. Globularetin C_9H_6O is an anhydride of cinnamic acid, $C_9H_8O_2$. Globularin, when boiled with potassa and potassium permanganate, yields benzoyl hydride; and the leaves, when distilled with a limited amount of sulphuric acid and potassium bichromate, furnish a certain quantity of oil of bitter almond.

The branches yield to the solvents mentioned above much smaller amounts of extract.

Globularia vulgaris contains the same constituents, but the leaves yield to carbon bisulphide 2·70, to ether 4·25, to chloroform 2·35, to alcohol 41·85, and to water 8·75 per cent. of extract. The volatile principle is present only in minute proportion.—*Jour. Phar. Chim.*, 1883, May, p. 361–366.

Nux Vomica.—W. R. Dunstan and F. W. Short have analyzed a number of authentic specimens of nux vomica with the following results:

First Series, 1877—Bombay Fine.—Diameter, 20·25 to 25·5, average, 23·0 mm.; thickness, 4·0 mm.; circumference, 60·0–82·5, average, 70·0 mm.; edge generally acute; texture very silky; form nearly flat, fairly regular, few concavo-convex and bent; cotyledons 7-veined, 2 outer veins small; alkaloids, 3·46 per cent.

Bombay Ordinary.—Diameter, 19·0–28·0, average, 23·0 mm.; thickness, 5·0 mm.; circumference, 60·0–82·5, average, 70·0 mm.; edge

generally rounded, some acute; texture silky; form nearly flat, some irregular, few concavo-convex; cotyledons, 2 outer veins small; alkaloids, 3·14 per cent.

Cochin.—Diameter like preceding; thickness, 4·0–6·0, average, 5·0 mm.; circumferepce, 57–79, average, 68 mm.; edge round, few acute; texture silky; form nearly flat, some concavo-convex, many irregular; cotyledons, 2 outer veins small; alkaloids, 3·04 per cent.

Madras.—Diam., 12·5–23·0, average, 18·0 mm.; thickness, 4·0–5·0, average, 4·5 mm.; circumference, 38·0–71·0, average, 57·0 mm.; edge generally round, seldom acute; texture dull; form nearly flat, some slightly concavo-convex, some irregular; cotyledons, 2 outer veins small, albumen resinous; alkaloids, 2·74 per cent.

Second Series, 1883—*Bombay,* like Bombay fine, above, but largest diameter 28 mm.; average thickness, 3·5 mm.; average circumference, 73 mm.; cotyledons, 2 lateral veins small, and sometimes indistinct; alkaloids, 3·90 per cent.

Cochin.—Like above, but average diameter 25 mm.; average thickness, 4·5 mm.; average circumference, 74 mm.; cotyledons, 2 lateral veins indistinct; alkaloids, 3·60 per cent.

Madras.—Like above, but average diameter 19 mm.; average thickness, 4·75 mm.; largest circumference, 65 mm.; cotyledons, 2 lateral veins indistinct; alkaloids, 3·15 per cent.—*Phar. Jour. and Trans.,* June 23, 1883, p. 1055.

Constituents of Ericaceæ.—Rich. Thal prepared *ericolin* from 300 pounds of the herb of *Ledum palustre* by boiling it in a still with water, precipitating with acetate and subacetate of lead, freeing the precipitate from lead, evaporating to an extract and exhausting this with spirit of ether. Ericolin, $C_{28}H_{30}O_3$, is inodorous, brown yellow, sticky, hygroscopic, strongly bitter, very soluble in alcohol and ether-alcohol, very sparingly soluble in ether, chloroform and benzin, and gradually decomposed when in contact with water, the odor of ericinol being developed, sugar dissolved, and a brown powder separated, which aggregates into a blackish-brown mass. This decomposition is rapidly effected by heating with dilute mineral acids and ericinol, $C_{20}H_{26}O$, by combining with water, is further converted into *hydroericinol,* $C_{10}H_{20}O_4$. The latter is a thick fluid, brown yellow, of a peculiar strong odor, and a balsamic, not bitter, taste; on keeping even in vacuo it becomes partly insoluble in ether.

Ericolin prepared from *Calluna vulgaris* differed somewhat from

the preceding. By following the process given in outline above, and treating the ether-alcoholic extract with warm dilute sulphuric acid, the odor of ericinol was observed, and the presence of ericolin shown in uva ursi and 29 other ericaceæ—namely, 6 species of Erica, 10 of Rhododendron, 3 of Vaccinium, 3 of Azalea, in Gaultheria Shallon, *Pursh*, Clethra arborea, Eriodictyon glutinosum, Epigæa repens and Ledum latifolium. The last two species and the rhododendrons gave the strongest odor of ericinol.

The lead precipitate mentioned above contains *leditannic acid*, $C_{15}H_{20}O_8$, which, in addition to the properties described by Willigk (1852) was found to have a distinctly acid reaction and acidulous astringent taste; it dissolves with difficulty in ether, more readily in acetic acid, and its aqueous solution precipitates cinchonine sulphate, dingy flesh-colored; lead acetate, light yellow; tartar emetic, brown; copper acetate, brown-black. Gelatin causes a copious precipitate, and silver nitrate is reduced. By dilute mineral acid it is split into water and *ledixanthin*, $C_{30}H_{34}O_{13}$; the latter is brown-red, sparingly soluble in water, and freely soluble in alcohol before drying.

The author prepared also *callutannic acid*, which resembles the above, but yields with gelatin only a turbidity. He instituted also comparative experiments with *pinipicrin*, and confirmed its close resemblance to ericolin, which had already been observed by Kawalier (1852), but could not prove the identity of the two compounds.—*Phar. Zeit. Russl.*, 1883, No. 14–18.

Oil of Angelica Root has been examined by Naudin. About one-half of the oil distils between 163° and 167° C., 25 per cent. between 167° and 330° C.; the remainder distils with difficulty, and the boiling point rises with each distillation. By fractional distillation in vacuo 75 per cent. of the oil is obtained as a colorless oil, which is not altered in the light, has a faint pepper-like odor, boils at 166° C., has the density ·870 at 0°C., and rotates polarized light + 5° 39′. Heated to 100° C., the oil is not altered, but at 160° C. it gradually becomes thick. The author proposes to call it *βterebangelene*.—See also *Am. Jour. Phar.*, 1882, p. 159.—*Rundschau*, June 20, 1883; *Compt. Rend.*, 96, p. 1152.

Saponin, which was discovered by Schrader (1809) in the root of Saponaria officinalis, has been prepared by Dr. E. Stuetz from quillaia bark by boiling the aqueous extract with alcohol. The yield was 2 per cent. Saponin is a white amorphous powder, of neutral reaction,

producing upon the tongue at first a mild impression without taste, followed by a slight astringency. It dissolves in water almost in all proportions, is soluble in aqueous alcohol and ether, but insoluble in absolute alcohol. Its formula is $C_{19}H_{30}O_{10}$, and contains five hydroxyl groups.—*Chem. Zeit.*, 1883, No. 49; *Liebig's Annal.*, vol. 218.

Viola tricolor var. arvensis.—Mandelin found in this plant a new coloring matter, *violaquercitrin*. The plant is exhausted with warm alcohol, the alcohol distilled off, and the residue treated with warm distilled water. On agitating this dark brown solution with benzin, for the purpose of obtaining the salicylic acid (see *Am. Jour. Phar.*, 1882, p. 10), a yellow crystalline mass is precipitated. After washing, the crystals are easily soluble in alkalies with a deep yellow color, and reprecipitated by acid. They are soluble in hot water, and crystallize again on cooling. Its composition is $C_{42}H_{42}O_{24}$. On being boiled with dilute mineral acids, it is split into quercetin, $C_{24}H_{16}O_{11}$, and a fermentable sugar, $C_6H_{12}O_6$. The acid filtrate contains a third product of decomposition, which may be obtained by agitation with chloroform, and is characterized by its beautiful fluorescence when in alkaline solution.—*Phar. Zeit. Russl.*, 1883, p. 329–334.

The Preparation of Cod Oil at Swampscott, Mass., not far from Lynn, and near the head of a bay, between Nahant and Salam, is thus described in the *Edinburgh Medical Journal*, Feb., 1883.

It is a place called the "Rocks," where in winter the codfish come in shoals to spawn, and the striped bass sport themselves in summer. During the winter months, be the weather what it may, unless the wind be rising for a gale, a little after midnight men may be seen going about the village, stopping here and there at houses, rousing the fishermen, who, by and by, gather in groups about the shore, each with his "dory," that well-known model of Yankee ingenuity which at the great Berlin fishery exhibition excited so much attention. The dories and their owners are soon aboard the various schooners in waiting, and by 5 A. M. the fleet is at the "Rocks;" so when the daylight is sufficient, the dories anchor about their respective larger craft, each boat with its single occupant, who is soon hard at work robbing the sea of its life. About 3 P. M., the signal is given from the schooner to come aboard; the dories hasten to their floating castles, with pitchforks the various "catches" are soon thrown aboard, and sail is made for home. During the passage the fish are gutted, the entrails cast into the sea, and the livers, some of them large enough to fill a quart

mug, are put into baskets. When the shore is close at hand, the fish are again put into the dories; but the roughness of the sea is such that these boats, when loaded, cannot land, and into the icy sea-water the horses are driven until the carts reach such a place that the cod-fish can be put into them, when off they go, to plod the night through for the early Boston market. The livers are immediately sorted over and the gall bladders carefully removed. The great luscious, flabby masses are thrown into a large oak tub; with this are connected steam pipes. When the receptacle is full and closed, low pressure steam is turned on, and for about two hours and a half cooking goes on. Then the plugs are taken out at the bottom, and the hot oil streams into buckets. It is now placed in butts in the cooling-room, and allowed to stay there until it freezes solid. So it is kept until opportunity offers, when it is put into canvas bags holding about four gallons each. These bags are then placed regularly upon a heavy oak table provided with outer grooves for conducting liquid, until twelve gallons are in a row. On this is laid a slab, then canvas bags, and so layer after layer, until about eighty gallons are piled up. A ton of pig iron is then placed upon the top slab of oak, and the oil begins to flow out. In about twelve hours dripping ceases, and the apparatus is taken apart. Inside the bags is found a yellowish butter-like mass, as hard as tallow, which is nearly pure stearin, with liver debris and fibers. This goes to the soap-makers, while the oil finds its way to the Massachusetts General Hospital and other places, where the superiority of the finest American oil over the Norwegian is recognized.—*Boston Med. and Surg. Jour.*

VARIETIES.

POISON OF ERGOT.—It seems, says "Nature," to result from recent researches by A. W. Pehl, brought before the Russian Chemical Society, that the poisonous action of the ergot, the bad effects of which are so often witnessed in Russia, is due to putrefaction-poisons, true ptomaines, which appear during the decomposition of the albuminoids in flour. The ergot, that is the sclerotium of the small mushroom, *Claviceps purpurea*, has energetic peptic qualities, and thus would directly contribute to the formation of ptomaines in the flour.

GLYCERIN.—M. Desguin, of Anvers, has given glycerin internally in certain forms of skin disease with, it is said, marked success, especially in acne punctata and the furuncular diathesis. He commences with four drachms daily and gradually increases the dose. He states that the secretion of the cutaneous glands, which is thick and irritating in these diseases,

becomes more liquid, and cutaneous irritation is notably lessened. During convalescence from scarlet fever, he believes that it facilitates desquamation.—*Buffalo Med. and Surg. Jour.*, May, 1883.

CONDENSED MILK.—Dr. Richard Neale raises his voice in the "Brit. Med. Jour.," March 24, 1883, against giving condensed milk to infants. "At times, given medicinally, it is of great value; but, as a food, it is unnatural, and sooner or later the infant must suffer if thus fed. I have in so many instances seen the fatal results of bringing up infants on the condensed milk, that I invariably warn patients against its continuous use. The most robust-looking child thus fed has no vitality, and is frequently cut off by an illness that, under other circumstances, would have proved very trivial." We can corroborate his experience.—*Med. and Surg. Rep.*, May 5, 1883.

QUASSIN AND ITS USES.—Quassin is the active principle of *quassia amara*. It is amorphous or crystallized. Both forms produce the same effects; the former is preferable at a dose of 0·04 to 0·10 gm. a day; of the latter a dose above 0·02 gm. produces toxic effects. In a healthy man quassin produces during the first days a rapid increase of the appetite, a more complete digestion of aliments and a rapid development of strength. At a dose of 0·04 gm. before meals, it increases the alvine discharges, and therefore becomes useful in constipation caused by a feebleness of the muscular tunic of the intestines. This property is a precious one, for it permits, in many cases, to substitute the quassin for purgatives, which frequently render the constipation invincible, without speaking of the returns which most often are produced after their administration. At the same dose of 0·04 gm. before meals, quassin has been given to patients having three or four diarrhœal discharges within twenty-four hours. After eight days of treatment the discharge became normal. Other experiments have proven that quassin has a most pronounced diuretic effect; that it increases the secretion of the salivary glands, of the fauces, of the kidneys, and also of the mammary glands. Quassin is a bitter tonic, aperient and stomachic. It must not be administered during the acute stages of diseases, but in the general debility, the atonic dyspepsia, the anorexia, the chlorosis, the spasmodic vomiting, the long and difficult convalescence, especially of fevers. —*Chicago Med. Jour.*, May, 1883; *Gazette des Hôpitaux.*

GUACHAMA, a tree which grows in Venezuela, contains in its bark and several layers of its wood an active principle. Guachama belongs to apocynaceæ. The extract ("Progrès Médical," March 24, 1881), which is of a sombre brown color and resinous, resembles curare, but it is slightly soluble in absolute alcohol, and insoluble in ether and chloroform. The principal difference between the action of curare and that of extract of guachama is that the latter, according to Scheffer ("Deutsche Medicinische Wochenschrift," No. 28, 1882), acts rapidly on the nerve centres, while the action of curare is slow. Schiffer found that in a case of spasmodic muscular contraction, the hypodermic injection of one-sixth of a grain of the solid extract resulted in slumber, at first slight, then deep, which lasted about three hours; circulation and respiration being normal. Reflex excitability was

preserved during slumber. Guachama seems likely to be a valuable hypnotic, but further experiments are needed.—*Gaillard's Med. Jour.*, April 28, 1883.

EXTRACT OF CALABAR BEAN.—This medicament has been recommended as an heroic remedy in obstinate constipation. Recent experiments undertaken in the service of Prof. Leyden, of Berlin ("Deutsche Medic. Woch."), demonstrate that this extract has a very rapid and sure action in atonic states of the intestine, characterized by flatulence, meteorism occurring just after meals, a sensation of weight in the epigastrium, habitual constipation, etc. The medicament was given in this form:

℞ Ext. calabar bean.....1 centigram.
Glycerin.....30 grams.

M. S.—Ten drops, daily.

The patients are greatly relieved, but the benefit is rarely durable, and if the remedy is continued for any length of time, toxic accidents are apt to supervene.—*Med. and Surg. Rep.*, May 5, 1883.

APOMORPHINE IN POISONING.—Dr. Routh ("Lancet," December 23, 1882) insists upon the great value of apomorphine in $\frac{1}{15}$ to $\frac{1}{8}$ grains as a ready and safe emetic in cases of poisoning. Emesis occurs in from two to five minutes; the contents of the stomach being voided in a rush without previous nausea, but with visible action of the stomach.—*Gaillard's Med. Jour.*, April 7, 1883.

IODINE AN ANTIDOTE FOR SNAKE BITE.—Dr. George H. Carpenter, of Moorefield, West Virginia, writes to the "Medical News." April 21, 1883, that he has secured excellent results in two cases of poisoning by the bite of the copperhead, from the internal administration of tinct. iodinii comp., fifteen drops in a third of a glass of water, and the local application of the tincture of iodine to the bitten limb or part. - *Med. and Surg. Rep.*, May 26.

THE EMPLOYMENT OF IODINE for the relief of the vomiting of pregnancy has been somewhat in vogue for a number of years. And while the success attending its use has been pointed out with more or less enthusiasm, its exact value has never been established. Dr. T. T. Gaunt ("Amer. Jour. Med. Sci.," April, 1883) has for a number of years been employing the compound tincture of iodine in drop doses in nearly all forms of emesis, and reports thirteen cases of the most varied character, in all of which vomiting was promptly arrested by the use of the drug.—*Weekly Med. Review*, April 28, 1883.

POP-CORN has been introduced to the materia medica by Dr. F. C. Wallace ("Medical and Surgical Reporter") as a remedy for the vomiting of pregnancy. It is to be prepared in the usual way in a wire popper and sprinkled lightly with salt, and is to be eaten freely. He speaks from an experience of several cases in which it served a good purpose, and reports

one in which accepted remedies had previously failed. Dr. E. J. Kemf, in the "Louisville Medical News," speaking favorably of personal experience with it, says that Dr. F. A. Burrall called attention to it three years ago.—*Albany Med. Annals*, 1883, p. 108.

NITROUS OXIDE AND CHLOROFORM.—Nitrous oxide and ether are frequently administered in combination, or rather in succession, as a means of producing anæsthesia. The employment of a combination of nitrous oxide and chloroform has been recently advocated by M. de Saint Martin. Experiments on animals lead him to prefer the mixture of eighty-five volumes of nitrous oxide with fifteen volumes of oxygen and six or seven grams of chloroform added to each hectoliter. This mixture causes anæsthesia very rapidly and the period of excitation is suppressed; and the chloroform, moreover, being much diluted does not irritate the air-passages. The working zone of this mixture is far greater than that of chloroform alone.—*Buffalo Med. and Surg. Jour.*, May 1883.

EDITORIAL DEPARTMENT.

THE CHEMICAL LABORATORY of the Philadelphia College of Pharmacy will hereafter be under the direction of Professor Samuel P. Sadtler, Ph.D., F.C.S., assisted by Professor Henry Trimble, Ph. G., a graduate of this College, and formerly a pupil of Professor Genth.

Professor Sadtler's acknowledged ability, and his extended experience in the Laboratories of Cambridge, Göttingen, and the University of Pennsylvania will now be joined with Professor Trimble's ample practice, and accurate knowledge of the needs of Pharmaceutical students. Professor Trimble has relinquished his interest in the drug business, in order to devote his whole time to analytical and other chemical work connected with the College. He is at present abroad visiting European laboratories, but will return in time to assume his duties, at the opening of the coming session. The Committee on Instruction and the Board of Trustees have cause for congratulation, in consummating an arrangement which thus brings both the theoretical and practical chemical work of the College under the same direction. The schedule and arrangement of the Chemical Laboratory course, as laid down in the announcement for the course of 1883–4, will be followed during the coming session.

AMERICAN PHARMACEUTICAL ASSOCIATION.—As stated in our last number, the Pennsylvania Railroad Company has agreed to sell excursion tickets between New York or Pittsburg or Canandaigua and Washington and intermediate points on their line at the rate of about 1⅓ fare for the round trip. The price of the tickets will be from New York $9.80, from Philadelphia $6.10, and from other points a corresponding rate. To obtain these tickets orders must be procured from the Permanent Secretary. The tickets will be good for the trip to Washington from September 8th to 10th, inclusive, and must be used on the day of purchase. The return coupons are good until September 16th.

It will be remembered that the meeting will be held in the lecture-room of the National Museum, located on the grounds of the Smithsonian Institution, and that the headquarters will be at the Arlington Hotel.

THE INTERNATIONAL PHARMACEUTICAL EXHIBITION AT VIENNA was opened August 11, but not by the archduke Carl Ludwig, as had been announced, and by this time the awards have doubtless been made in the different classes. The invitations were extended at such a late date, that even if there had been a disposition on the part of many American firms, only few could have availed themselves of the opportunity of showing their products in Central Europe. Yet the United States are represented by four firms; with these exceptions, all the exhibitors are from European countries, including three or four from England.

We look forward with some interest to the details of the exhibits, and to the results that may accrue from this experiment to the general good. We have annually in the United States such a large number of pharmaceutical exhibitions—one at the meeting of nearly every State, and of the American Pharmaceutical Association—and these partake more or less of an international character, that it will probably be a long time before the example of Vienna will find enthusiastic advocates on this side of the Atlantic, unless it was possible to create sufficient interest in the enterprise by all the more prominent nations of both hemispheres.

SOPHISTICATION OF QUININE.—The Central Pharmacy of the Paris hospitals received in October and November, 1882, several cans of quinine sulphate, which on examination proved to be a mixture of the sulphates of quinine and cinchonidine covered with a layer of pure quinine sulphate about 12 or 15 centimeters thick. It had been delivered under contract by a Paris druggist, H. C. Lacomb, who explained the occurence as an unintentional mistake on the part of one of his employees, who had been ordered to mix two cans each of quinine of Taillandier's and of Milan manufacture, and to fill with the mixture four cans bearing the label of the latter factory; the superficial layer of the pure salt was asserted to have been made solely on account of its handsome appearance. It was shown, however, from the books of the accused, that Taillandier's quinine had not been on hand for a prolonged period, as had been asserted, but was purchased September 20, and that shortly before this time, eight kilos of cinchonidine had been purchased. The motive for the adulteration was found in the advance of the price of the Milan quinine, which in August, 1882, was 400 francs per kilo, while the contract price was only 374 francs. The accused was found guilty of wilful adulteration, and in view of the fact that he knew the medicine had been intended for the sick in public charitable institutions, and that the act was aggravated thereby, the court sentenced the accused to pay a fine of 50 francs, to be imprisoned for one year, and that in addition thereto the verdict be exposed to public view for twenty-four hours, attached to the door of the business place of the accused, and at his cost be published in full in six newspapers, in three pharmaceutical, and in three medical journals.

The verdict is almost draconic in severity. Some years ago a druggist in this country bought cinchonidine, converted it into the hydrochlorate, and sold it in considerable quantities in bottles, with Pelletier's labels and wrappers imitated; he may have made some money by this fraud, but his punishment consisted in the loss of confidence and reputation he may have enjoyed previous to this transaction. What would have been his fate if measured by the strict laws of France?

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Proceedings of the Second Annual Meeting of the Massachusetts State Pharmaceutical Association, held in Peabody Guard Hall, Springfield, May 16 and 17, 1883. Lynn. 8vo, pp. 198.

A brief notice of the meeting will be found on page 334 of our June number. It was at this meeting that the proposition for the organization of a National Retail Druggists' Association took a practical shape. The first 122 pages contain the minutes and reports; the following 55 pages the various essays on ethical and practical subjects. The book is very creditably printed, but the absence of an index or table of contents detracts from its usefulness.

Handwörterbuch der Pharmakognosie des Pflanzenreichs. By Prof. Dr. G. C. Wittstein. Sechste Lieferung. Breslau: Eduard Trewendt, 1883. 8vo.

Dictionary of Vegetable Pharmacognosy. Part 6.

The part now before us, covering pages 721 to 864, embraces the articles Sandelholz (santal wood) to Traubenkirsche (grape cherry, Prunus Padus), the different drugs being treated of in the manner previously described.

A Treatise on Therapeutics comprising Materia Medica and Toxicology, with special reference to the application of the physiological action of drugs to clinical medicine. By H. C. Wood, M.D., Professor of Materia Medica and Therapeutics, etc., in the University of Pennsylvania. Philadelphia: J. B. Lippincott & Co., 1883. 8vo, pp. 740. Price $6.

The favor with which this work has been received is evidenced by the rapid exhaustion of the previous editions, so that now the fifth edition is put into the hands of the physician, which as compared with its predecessors has been thoroughly revised and enlarged. As indicated in the title the work was written with special reference to the application of the physiological action of drugs to clinical medicine. With regard to experiments upon animals, the author states that in the vast majority of cases, the actions of drugs upon man and upon the lower animals are, though seemingly different, in reality similar; that the more knowledge we acquire, the fewer exceptions remain unexplained; and that the whole matter is in all probability subject to laws whose development will greatly aid in our explanations of various obscure clinical phenomena.

After a brief introduction, the action and application of drugs are considered, these being divided into substances which act on the solids and fluids of the body, and such which act externally to the body, the latter comprising antacids, anthelmintics, etc. The drugs of the first kind are again subdivided into general and local remedies, and these into different classes according to their physiological action, such as astringents, tonics, cardiac stimulants, etc. After the drugs, such remedies which are not drugs are considered, namely caloric and electricity, and a brief chapter on the art of prescribing medicines has been added in the appendix, which contains also a number of valuable tables.

Throughout the work the medical literature of this country and Europe is copiously referred to. In preparing the present edition, several references to the arrangement of the former Pharmacopœia and to processes for the preparation of certain chemicals have not been altered to conform to the present Pharmacopœia, an oversight which does not in the least detract from the value of the work.

The Book of Plant Descriptions, or Record of Plant Analyses, with a Synopsis of the Terms most frequently used in the Description of Plants, and a Schedule of Work to be performed in the Botanical Laboratory; also a List of Subjects suitable for Theses. Prepared for the use of teachers and students, by G. C. Groff, A.M., M.D., Professor, etc., in the University at Lewisburgh, Pa. Science and Health Publishing Company, 1883.

The blank forms are very conveniently arranged, and if properly used cannot fail to induce in the student the commendable habit of accurate and full observation.

Bericht der Wetterauischen Gesellschaft für die gesammte Naturkunde zu Hanau, 1879–1882. Von dem ersten Director derselben, Realschuldirector Friedrich Becker. Hanau: Waisenhaus-Buchdruckerei, 1883. 8vo, pp. 104.

Report of the Wetteravian Society for the Natural Sciences for the years 1879–1882.

Besides the usual reports, biographical notices, etc., the pamphlet contains a list of the mammals, birds, reptiles, fishes and beetles found in the district of Rotenburg, with remarks on the habits, uses, etc., of the vertebrates.

Ueber das Vorkommen und die Bildung des Peptons ausserhalb des Verdauungs apparates und über die Rückverwandlung des Peptons in Eiweiss. Von Dr. Chem. Alexander Poehl. St. Petersburg, 1882. Pp. 108.

On the Occurrence and Formation of Peptone Outside of the Digestive Apparatus, and on the Retransformation of Peptone into Albumen.

This is a thesis written with the view of obtaining from the University of Dorpat the degree of "Doctor in Chemistry." The essay considers the preparation, chemical properties, reactions and quantitative determination of peptone, and proves its presence outside of the digestive canal, as a pathological constituent of urine, in saliva, ovarian cysts and cancerous tissues. Most of the animal and vegetable tissues have the property—outside of the

digestive apparatus—of converting albuminoids into peptone; this is particularly the case with the lungs and kidneys. This conversion is not a decomposition or splitting of the molecule of albuminoids, but consists in the softening or swelling of the latter, a condition which is effected also by a large number of plants. Peptone may again be transformed into albuminoids by the action of agents attracting moisture, such as alcohol and neutral alkali-salts; but the time of this influence is an important factor in this transformation. (See also page 444 of the present number.)

Report of the Board of Managers of the Pennsylvania Hospital to the Contributors, at their Annual Meeting, held May 7, 1883. 8vo, pp. 37.

Pharmacie Centrale de France. Compte rendu de l'Assemblée générale annuelle du 29 Avril, 1883.

Report to the General Annual Meeting of the Central Pharmacy of France.

The Bead Suture, a Modification of the Quilled Suture, etc. By David Prince, M.D.

From the Brooklyn "Annals of Anatomy and Surgery."

The Percentage of College-bred Men in the Medical Profession. By Chas. McIntyre, Jr., M.D., of Easton, Pa. Philadelphia, 1883. 8vo, pp. 13.

A valuable paper on an important subject, read before the American Academy of Medicine, October 27, 1882.

Twenty-sixth Annual Report of the Pharmaceutical Council of the Pharmaceutical Society of Victoria, 1883; with List of Members and Honorary Members. Melbourne, 1883. 8vo, pp. 15.

The roll of members contains about 250 names. During the past year the first session of the Melbourne School of Pharmacy has been carried through successfully.

Remarks on Hydrophobia. By Chas. W. Dulles, M.D.

A paper read before the Philadelphia County Medical Society; reprinted from the Philadelphia "Medical Times," August 11, 1883.

Report for the year 1882–1883 *of H. A. Newton, Director of the Observatory in Yale College, and of Leonard Waldo, Astronomer in charge of the Horological and Thermometrical Bureaus.* New Haven.

From the last-named report we note more particularly the increase in the work of examining and verifying physicians' thermometers, the number being 5,140 during the past year against 3,811 and 1,667 during the two preceding years.

The History of Tuberculosis from the Time of Sylvius to the Present Day: being in part a Translation, with Notes and Additions, from the German of Dr. Arnold Spina; containing also an Account of the Researches and Discoveries of Dr. Robert Koch and other Recent Investigators. By Eric E. Sattler, M.D. Cincinnati: Rob. Clarke & Co., 1883. 12mo, pp. 190. Price, cloth, $1.25.

As stated upon the title-page, a portion of the book—about two-thirds—is a translation from a work by Dr. Spina entitled "Studien über Tuberculose." The remaining portion gives the history of the controversy which has arisen from the announcement, in March, 1882, by Dr. Koch, of the discovery of the Bacillus tuberculosis. This history appears to be written without prejudice, and with the earnest desire of fairly placing the arguments advanced by the different observers before the intelligent reader.

Lessons in Qualitative Chemical Analysis. By Dr. F. Beilstein, Professor at the Imperial Institute of Technology of St. Petersburg. Translated from the Fifth Edition, with Copious Additions, including Lessons in Organic and in Volumetric Analysis. By Chas. O. Curtman, M.D., Professor of Chemistry in the Missouri Medical College and in the St. Louis College of Pharmacy. St. Louis, Mo.: St. Louis Stationery and Book Company, 1883. 12mo, pp. 154. Price, in cloth, $1.50.

Beilstein's "Anleitung" is well known in Europe, and used in many schools as a guide to analytical work, and preparatory to more elaborate investigations. As edited by Professor Curtman it has been adapted to the wants of the medical and pharmaceutical student, with special reference to the U. S. Pharmacopœia.

After a short but well-arranged chapter on chemical manipulations, the different metals and their compounds with mineral and a few organic acids are taken up, commencing with the alkalies and terminating with the metals, the sulphides of which are soluble in ammonium sulphydrate. The compounds selected are all easily obtainable, and for the most part quite familiar to most students, such as sodium chloride, carbonate and sulphate, potassium nitrate, ammonium chloride, Rochelle salt, etc.; they are tested first in the solid state by the application of heat with or without the use of a blow-pipe, and next in solution, tests for the base and acid being applied.. This chapter concludes with the examination of some rarer compounds like gold chloride, and others requiring certain precautions, like potassium iodide, sodium hyposulphite, etc., or which are insoluble in water and acids, like barium and strontium sulphate.

Chapters on the systematic course of analysis follow next, with substances containing a single base, and such which contain two or more bases; those which are insoluble in water and acids being considered separately. The detection of the common and rarer mineral and organic acids and the analysis of silicates and cyanides conclude this chapter.

Next follow examples for practice in analysis of organic substances, viz., alcohol, chloroform, chloral hydrate, glucose, cane sugar, phenol, morphine, quinine, cinchonine, strychnine and atropine. The last 40 pages are devoted to volumetric analysis, the methods for estimating acids and alkalies being considered, followed by determinations by means of oxidation and by precipitation.

The matter is conveniently arranged, and the typography is such as to attract the eye to the more important facts; the wood-cuts, 12 in number, and a spectrum chart explain and facilitate the use of the various apparatus, and the instructions for making the necessary calculations from the

results obtained will be a welcome aid to the beginner. Though the scope is intentionally limited, the book will be found a useful and, we think, a reliable guide for the student entering upon analytical work.

The American Homœopathic Pharmacopœia. Second Edition. Thoroughly revised and augmented by Joseph T. O'Connor, lately Professor in the New York Homœopathic Medical College. Compiled and published by Boericke & Tafel, New York, Philadelphia, Chicago. 1883. 8vo, pp. 511.

The work partakes less of the nature of a pharmacopœia than it does of the dispensatories in use, with the physiological and therapeutical properties and uses omitted. There is scarcely an attempt made at describing the crude drugs, brief botanical descriptions of the plants and their habitat being substituted in place thereof. The few attempts at the characterization of the histological structure are made without a clear comprehension of the subject; thus it is said of black hellebore: "Imbedded in the pith, but not reaching its centre, are six to ten wedge-shaped bundles of wood fibre which radiate and extend into the substance of the bark." The botanical terms are likewise frequently used erroneously or in an inexact manner. Levant wormseed, cina, is said to be frequently mixed with the scales of the *calyx;* the strobiles of hop, lupulus, are stated to bear rudimentary *leaflets* on a central irregular stalk, etc. The chemicals are somewhat better off than the vegetable drugs; but there appears to be little uniformity in the extent to which the processes, the physical characters and the chemical tests are referred to.

The chief interest for us in this work lies in the materia medica list and in the pharmaceutical processes. Of the latter we propose to speak in a future number. Regarding the former, we find that the drugs used in regular practice are likewise employed by homœopathic practitioners, and in addition thereto a large number, which are used in domestic practice, or which were formerly recognized and are now discarded by most pharmacopœias, though from time to time one or the other is galvanized into a short-lived notoriety by an enthusiastic physician. A number of drugs in use in foreign countries and rarely seen here, have likewise found a place in this pharmacopœia.

The drugs derived from the animal kingdom bear a striking resemblance to those generally employed about two centuries ago. The poisons from half a dozen or more reptiles and from some insects; the gall, liver and lungs of the fox, the saliva of the South American toad; the fresh hide with the hair on, of the Brazilian stag; fresh bedbugs, spiders, plant lice, etc., form a collection of remedies which may possibly possess some historical interest, but beyond this have no claim to be considered as remedial agents. *Psorinum*, the pus from the itch pustle; *variolinum*, the contents of a ripe small-pox pustule and other similar substances have been retained in the present edition; but others which were honored with some notice in the first edition, have been omitted; among them such with suggestive names like buboinum, gonorrhin, syphilinum, etc.

The book is well gotten up, and will doubtless prove of interest to those who may seek an acquaintance with homœopathic materia medica and pharmacy.